APPENDIX A

EARLY COORDINATION NOTIFICATIONS AND RESPONSES

United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Bill Anoatubby
Governor, Chickasaw Nation
P.O. Box 1548
Ada, OK 74821

Dear Mr. Anoatubby:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Tribal Consultation and Coordination

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

Restoration of some additional historically open areas that once dominated the view shed within the park will enhance visitor understanding and appreciation of the intricacies of siege operations at Vicksburg, as required by the enabling legislation and specified in the Park General Management Plan and Interpretive Prospectus.

In accordance with NEPA, we are eliciting your comments and invite you to review the project. Please contact us by November 5, 2007 with your initial concerns and comments.

If you have questions or concerns, or need additional information, please contact me by writing at the letterhead address above. We would also be happy to arrange a meeting with you at your convenience to discuss this project. Please contact me through my email address, monika_mayr@nps.gov, or by telephone at 601-619-2902.

We look forward to receiving your input on this project.

Sincerely,

Monika Mayr

Monika Mayr
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Hank Holmes
Director, Mississippi Department of Archives and History
P.O. Box 571
Jackson, MS 39205-0571

Dear Mr. Holmes:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Compliance with Section 106 of the National Historic Preservation Act and National Environmental Policy Act (NEPA)

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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In accordance with NEPA and 36 CFR 800 requirements, we are eliciting your comments and invite you to review the project. Please contact us by November 5, 2007 with your initial concerns and comments. An Environmental Assessment will be prepared and will be sent to you for comment after that date.

If you have questions or concerns, or need additional information, please contact me by writing at the letterhead address above. We would also be happy to arrange a meeting with

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Monika Mayr
Superintendent

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NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Homer L. Wilkes
State Conservationist
NRCS
Suite 1321, Federal Building
100 West Capitol Street
Jackson, MS 39269

Dear Mr. Wilkes:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Early Coordination and Compliance with the National Environmental Policy Act (NEPA)

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Charlie Morgan
State Forester
Mississippi Forestry Commission
301 North Lamar Street, Suite 300
Jackson, MS 39201

Dear Mr. Morgan:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Early Coordination and Compliance with the National Environmental Policy Act (NEPA)

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Ron Nassar
Project Leader
U.S. Fish and Wildlife Service
2524 South Frontage Road, Suite C
Vicksburg, MS 39180-5269

Dear Mr. Nassar:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Current List of Federally Listed Threatened and Endangered Species

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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This letter will serve as a record that the NPS is initiating informal consultation with your agency pursuant to the requirements of the 1973 Endangered Species Act, as amended, and 2001 NPS Management Policies.

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NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Ms. Trudy Fisher
Executive Director
Mississippi Department of Environmental Quality
P.O. Box 20305
Jackson, MS 39289-1305

Dear Ms. Fisher:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Early Coordination and Compliance with the National Environmental Policy Act (NEPA)

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Ms. Christine Norris
Tribal Chief, Jena Band of Choctaw Indians
P.O. Box 14
Jena, LA 71342

Dear Ms. Norris:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Tribal Consultation and Coordination

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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We look forward to receiving your input on this project.

Sincerely,

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United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Gregory E. Pyle
Chief, Choctaw Nation of Oklahoma
P.O. Drawer 1210
Durant, OK 74702

Dear Mr. Pyle:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Tribal Consultation and Coordination

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We look forward to receiving your input on this project.

Sincerely,

Monika Mayr

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Superintendent

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United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Ms. Brenda Dardar-Robichaux
Chief, United Houma Nation
20986 Hwy. 1
Golden Meadow, LA 70357

Dear Ms. Dardar-Robichaux:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Tribal Consultation and Coordination

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Monika Mayr
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United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Veasley Denson
Chief, Mississippi Band of Choctaw Indians
P.O. Box 6010
Choctaw, MS 39350

Dear Mr. Denson:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Tribal Consultation and Coordination

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Monika Mayr
Superintendent

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United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Bob Strader
Supervisory Wildlife Biologist
Jackson Migratory Bird Field Office
U.S. Fish and Wildlife Service
6578 Dogwood View Parkway, Suite B
Jackson, MS 39213

Dear Mr. Strader:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Current List of Federally Listed Threatened and Endangered Species

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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We look forward to receiving your input on this project.

Sincerely,

Monika Mayr
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Ray Aycock
Field Supervisor
U.S. Fish and Wildlife Service - Mississippi Ecological Services Field Office
6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213

Dear Mr. Aycock:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Current List of Federally Listed Threatened and Endangered Species

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

USGS State Representative
308 South Airport Road
Pearl, MS 39208

Dear Sir/Madam:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Early Coordination and Compliance with the National Environmental Policy Act (NEPA)

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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We look forward to receiving your input on this project.

Sincerely,

Monika Mayr
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE
VICKSBURG NATIONAL MILITARY PARK
3201 Clay Street
Vicksburg, MS 39183-3495
(601) 636-0583

October 5, 2007

Mr. Earl Barbry, Sr.
Chairman, Tunica-Biloxi Tribe
P.O. Box 1589
Marksville, LA 71351

Dear Mr. Barbry:

Reference: Vicksburg National Military Park Cultural Landscape Report and Environmental Assessment

Subject: Tribal Consultation and Coordination

The National Park Service (NPS) is preparing a Cultural Landscape Report and an Environmental Assessment to address rehabilitation of battlefields at Vicksburg National Military Park in Vicksburg, Mississippi. NPS is currently in the process of developing the scope of these rehabilitation activities.

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Sincerely,

Monika Mayr
Superintendent

Enclosures

Va –
For your files
Thx,
M-

DEPARTMENT OF THE ARMY

VICKSBURG DISTRICT, CORPS OF ENGINEERS
4155 CLAY STREET
VICKSBURG, MISSISSIPPI 39183-3435

REPLY TO
ATTENTION OF:

October 12, 2007

Operations Division

SUBJECT: Early Coordination and Compliance with the National Environmental Policy Act

Ms. Monika Mayr
National Park Service
Vicksburg National
Military Park
3201 Clay Street
Vicksburg, Mississippi 39183-3495

Dear Ms. Mayr:

We received your correspondence, subject as above, on October 12, 2007. While we are working diligently to reply to you in a timely manner, please be aware this office is experiencing an unusually heavy workload at this time. For ease of reference, we assigned your correspondence the identification number MVK-2007-1140. Please refer to this number should you write or call us about your request.

If you have any questions about the status of your request, please call this office at (601) 631-5064 or (601) 631-7071.

Sincerely,

Kenneth P. Mosley
Regulatory Branch

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mississippi Field Office
6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213

October 22, 2007

Ms. Monika Mayr
Superintendent
National Park Service
Vicksburg National Military Park
3201 Clay Street
Vicksburg, Mississippi 39183-3495

Dear Ms. Mayr:

The U.S. Fish and Wildlife Service (Service) has received your request dated October 5, 2007, for information regarding the potential presence of federally listed species on the Vicksburg National Military Park in Warren County, Mississippi. Our comments are submitted in accordance with the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The threatened bald eagle (*Haliaeetus leucocephalus*) is the only species of sea eagle regularly occurring on the North American continent. The bald eagle is predominantly a winter migrant in the southeast; however, increasing occurrences of nesting have been observed. The bald eagle nests in the transitional area between forest and water. They construct their nests in dominant living pines or bald cypress trees. Eagles often use alternate nests in different years with nesting activity beginning between September and January of each year. Young are usually fledged by midsummer.

The bald eagle was officially removed from the List of Endangered and Threatened Species as of August 8, 2007; however, it continues to be protected under the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.), and the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d). Should any of the proposed project activities be located near an active bald eagle nest, we recommend that construction activities be conducted in accordance with the Service's National Bald Eagle Guidelines (www.fws.gov)

If you have any additional questions, please feel free to contact this office, telephone: (601) 321-1132.

Sincerely,

Kathy W. Lunceford
Fish and Wildlife Biologist

APPENDIX B

BMPS FOR CULTURAL LANDSCAPE RESTORATION

PROPOSED BMPS FOR BATTLEFIELD REHABILITATION

The lists below highlight major categories of actions being proposed in this Environmental Assessment and applicable Best Management Practices (BMPs). These BMPs are largely based on the Mississippi Forestry Commission's document titled Mississippi's BMPs: Best Management Practices for Forestry in Mississippi and the Forest Stewardship Council (FSC) Regional Forest Certification Standard for the Mississippi River Alluvial Valley and Gulf Coastal Plan. Additional BMPs pertaining to invasive species and archeological resources are also described.

Both of these documents are available online at:

http://www.mfc.state.ms.us/pdf/Mgt/WQ/Entire_bmp_2008-7-24.pdf
http://www.fscus.org/images/documents/2006_standards/mav_working_3.3.pdf

ACTIONS RELATED TO TREE THINNING, LIMBING AND REMOVAL

Both of the referenced guides suggest that preharvest planning is one of the keys to preventing soil erosion and sedimentation. Careful planning of road locations, logging, harvesting practices, and watercourse protection are recommended. To avoid non-point pollution problems such as excessive sediments, organic debris, chemicals, nutrients, and an increase in average water temperature, the guide recommends the establishment of streambank buffers, which are vegetated areas adjacent to streams and watercourses that help protect them from pollutants. The residual vegetation acts as a filter to trap sediments, chemicals, and nutrients before they reach the water. Some of this vegetation along perennial streams also provides the shade necessary to avoid adverse changes in water temperature.

For the battlefield rehabilitation, streambank buffers will be utilized to minimize and mitigate impacts to wetland areas. Within a 50-foot buffer along streams (25 feet on each side), trees over 15 feet tall would be removed, while trees less than 15 feet tall would remain. This 50-foot streambank buffer would be replanted with native species as necessary to maintain woody vegetation along the streambanks. Vegetation in this area would be maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Outside of the 50-foot streambank buffer, wetland areas would be replanted with low-growing native grasses. Native woody vegetation would be allowed to naturally repopulate this area but maintained to a maximum height of 15 feet.

The principals associated with streambank buffers within the guidelines include:

1. Never use a stream channel as a skid trail or road.
2. Remove logging debris from stream channels.
3. Minimize the number of stream crossing points.
4. Cross streams only at a right angle.
5. Never block the flow of water through a stream channel.
6. Avoid rutting through streams.
7. Avoid high intensity fire in streambank buffers.
8. Minimize residual tree damage.

9. Harvest of any stems on the edge of a stream channel must be accomplished in such a manner as to minimize impact to the stream bank.

Streambank buffers are areas that extend from both stream banks to a distance determined by the slope of the land. The streambank buffers are designed to trap sediments so are recommended to be thicker as the steepness of the adjacent slope increases due to the associated increased velocity of overland stormwater flow. The intent of streambank buffers is also to maintain sufficient overstory and understory crown cover to provide shade, maintain bank stability, and protect water quality. Additional benefits include enhancing wildlife habitat, creating wildlife corridors, and providing habitat diversity in harvested areas. Another topic addressed by the cited sources is the roads to be established to facilitate removal of cleared trees. These routes are referred to as skid trails and haul roads, and measures need to be put into place to control erosion associated with these constructed corridors. Skid trails are used for moving harvested materials from stump to landing.

They need to be designed to avoid potentially sensitive areas and problem soils and so that they drain properly. Skid trails also require maintenance if they are to retain an effective drainage system.

Haul roads are the primary roads used to transport harvested timber from a site. Like skid trails, haul roads need to sited to avoid potentially hazardous areas and problem soils, and designed to accommodate drainage to limit soil erosion. Haul roads should be constructed and used during dry periods as possible. These road surfaces will also require maintenance to avoid the development of ruts. Both road types should be revegetated after they are retired.

The referenced guides provide additional guidance on establishing water control methods in association with roads established to support tree clearing that are intended to reduce sedimentation from logging activities. The methods described include slash dispersal, revegetation, silt fences and hay bales, water bars, water turnouts, and broad-based drainage ditches.

Slash is debris created in the process of a logging operation. Slash dispersal is an immediate solution for preventing soil movement on an active logging site. Scatter slash over exposed soil or use it to build water bars.

Revegetation is using seed or mulch to protect trails, roads, or other exposed soil.

Silt fences and hay bales are erosion and sedimentation reducers. They can be used to stabilize exposed soil around stream crossings, or embedded roadways and trails.

Water bars are mounds of soil or placed wood to divert runoff water from the road.

Water turnouts are extensions of a drainage ditch into a vegetated area, providing for the dispersion and filtration of stormwater runoff.

<u>Tree Clearing</u>

1. Do not allow surface water runoff from any type of soil disturbance to run directly into a watercourse.

2. Maintain the integrity of all streambeds and banks. When it is necessary to alter a stream's course for any reason, return the streambed and banks, as near as possible, to their original condition.

3. Do not leave debris of any type (logging or inorganic) in streambeds.

4. Do not spray chemicals directly into water or allow chemicals, herbicides, fertilizers, or petroleum products to degrade surface or groundwater.

5. Leave streambank buffers along watercourses both to filter sediment from overland flow and to maintain the inherent, normal temperature of water in all streams and other bodies of water.

6. Provide for rapid revegetation of all denuded areas through natural processes supplemented by artificial revegetation where necessary.

Additional considerations derived from the FSC Regional Forest Certification Standard include:

- Guidelines shall be prepared and implemented to control erosion; to minimize forest damage during harvesting, road construction, and all other mechanical disturbances; and to protect water resources.

- Logging operations and construction of roads and skid trails are conducted only during periods of weather when soil is least susceptible to compaction, surface erosion, rutting, or sediment transport into streams and other bodies of water.

- Construction of skid trails is minimized.

- Felling and extraction are planned to minimize adverse effects on standing trees, ground cover, soil, and sensitive environmental features.

- Silvicultural techniques and logging equipment are selected according to slope, erosion-hazard rating, and/or risk of landslides in order to minimize soil disturbance and erosion, and avoid mass failure.

- Plans for site preparation specify the following mitigations to minimize impacts to the forest resources:

    - Slash is concentrated only as much as necessary to achieve the goals of site preparation and the reduction of fuels to moderate or low fire hazard levels.

    - Scarification of soils is limited to the minimum necessary to achieve successful regeneration of desired species.

- Removal and relocation of mineral and organic layers of soil is minimized during logging and site preparation.

- The transportation system is designed, constructed, maintained, and/or reconstructed to minimize the extent of the road network and its potential cumulative adverse effects.

<u>Access Trails and Roads</u>

- Follow BMP guidelines for access trails and roads.

- Use procedures which will promote the quick healing of skid trails (such as restoring the skid trails to their natural shape and grade, erosion and sediment controls, and replanting).

- Conduct skidder logging on the contour as much as possible.

- Skid uphill when skidding must be done against the contour.

Streambank Buffers

- Maintain the streambank buffers between harvest areas and watercourses.
- Mechanical site preparation should remain outside of the streambank buffers
- Within the 50-foot buffer, trees taller than 15 feet would be removed, while trees shorter than 15 feet would remain. Vegetation in the buffer would be maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Removal activities would occur by hand within the streambank buffers.

Logging Debris

- Avoid introducing organic debris into streams, which can alter the natural temperature and oxygen content of the water. Debris can also alter the natural flow, or movement, of the stream, which may lead to increased sedimentation in the stream.
- Remove tree tops and other logging debris from streams.

Equipment Maintenance

- Avoid spillage or discharge of petroleum products, antifreeze, and other maintenance materials, especially near streams and other bodies of water.
- Drain equipment fluids into containers and dispose of according to label directions.
- Dispose of all empty containers in the same manner.
- Report discharges or spills in accordance with the requirements of the Mississippi Department of Environmental Quality.

Landings and Concentration Yards

- Locate a landing or concentration yard on a site which will not present an erosion and subsequent siltation problem.
- Leave an adequate buffer zone between landings and watercourses.
- Landings and yards should have a slight slope to allow drainage.
- Provide for adequate drainage on approach roads so that road drainage water does not enter the landing area, causing muddy wet conditions.
- Provide for stabilization of landings immediately following the completion of operations.

Portable Sawmills and Sawdust

- Locate portable sawmills on reasonably level sites.

- Deposit sawdust on level ground.
- Divert runoff water around a sawdust pile by ditching.
- Locate sawdust piles at least 300 feet from streams.

Other Considerations

- Perform clearing or thinning operations in the fall and winter when fewer visitors are at the park, dormant trees are less likely to be damaged, there are no nesting birds or animals in the vegetation, and sufficient time would be available to remove ground vegetation before spring growth.
- The use of heavy vehicles should be minimized, and consideration should be paid to using low tire pressure vehicles.
- Operations should occur only when the soil is firm to reduce the degree of compaction.
- NPS would notify potential visitors (such as through the Park's website) of pending clearing operations.
- Stump removal in the cleared areas would be addressed as follows:
    - In areas where mechanical maintenance would not occur, stumps would remain in place
    - In areas where mowing or burning would occur, stumps would be removed. With stump removal, archeological surveys would be conducted after clearing.
- Remove felled trees without dragging, which gouges the ground surface.

ACTIONS RELATED TO ESTABLISHING NEW COVER (FOREST OR MEADOW)

Preparation for forest cover

- Road surfaces and landings should be smoothed and shaped to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and maintenance.
- Culverts should be maintained or replaced with water bars or ditches adequate to carry the runoff.

Seedbed preparation

- The top layer of soil should be loosened by raking, disking or other acceptable means before seeding.
- Chisel or loosen compacted areas.
- Spread available topsoil over unfavorable soil conditions.
- When conventional seeding is to be done, no preparation is required providing the soil material is loose (i.e., on a fresh skid trail) and has not been sealed by rainfall.

- On smooth, cut slopes or compacted trails the surface will require pitting, trenching or scarifying to provide a place for seed to lodge and germinate.

- Incorporate lime and/or fertilizer into the top 3 to 4 inches of soil as a part of seedbed preparation when practical.

- Selecting the proper plant species suitable to the soil and seasonal condition is vital to establishing an effective vegetative cover. Appendix C contains a list of native tree species that would be considered for the reforestation effort.

Seeding

- Inoculate legume seed with proper inoculant before planting.

- Apply seed uniformly by broadcasting with a cyclone seeder or close drilling.

- Normal depth for covering seed ranges from ¼ inch for ryegrass to 1 inch for small grain.

- When seed is applied with a hydraulic applicator, firming the soil is not necessary.

Tree Planting

- Tree planting by hand causes little, if any, erosion.

- Tree planting by machine may temporarily cause erosion. The plow point and coulter blade on the planting machine creates a planting slit in which a seedling is placed. The slit is closed around the seedling by the planter's packing wheels, which may create a depression on each side of the slit. The depressions may channel surface water runoff, thus creating an erosion problem. To avoid ditch formation, machine planting should follow the contour of the site.

Lime and Fertilizer

- For the establishment of vegetation such as grasses and/or legumes, apply lime and fertilizer as needed for the species to be planted.

INVASIVE PLANT SPECIES CONTROL

Herbicide Application

The use of herbicides should be carefully planned and applied to prevent the contamination of streams and lakes, which may damage fish and other aquatic life:

- The herbicide applicator will provide documentation of training/certification in herbicide application.

- Choose an herbicide registered for intended uses and suitable for use on target species.

- Herbicides should also be suitable and safe for use with available methods of application.

- Always use herbicides in accordance with label instructions.

- Store herbicides where there is no danger of being spilled or released into the environment.
- Do not mix chemicals near springs, streams and lakes.
- Since wind and high temperatures increase the chance of herbicide drift, volatilization and pollution of water and atmosphere, make sure that atmospheric conditions are such that a maximum amount of chemical reaches target species, especially during aerial or spray applications.
- Never apply herbicides directly to water (except when the chemical is approved for application over water).
- Clean chemical application equipment away from streams and other water sources.
- Dispose of excess herbicides and containers in accordance with label instructions.

Site Activity

- Do not allow the introduction of new invasive species into project areas (pits, construction etc)
- All individuals working, volunteering or recreating should clean mud, dirt, and plant parts off vehicles, pets, equipment and boots before going onto public lands.
- Use uninfested areas for staging, parking, and cleaning equipment.
- Keep active road construction sites that are in relatively invasive species free areas closed to vehicles that are not involved with construction.
- If possible, begin activities in uninfested areas before operating in infested areas. Clean equipment via equipment cleaning stations before moving to an invasive species free area.
- Minimize contact with roadside sources of invasive species seed and propagules that could be transported to other areas or restrict to those periods when spread of seed or propagules are least likely.
- Minimize soil disturbance and retain desirable vegetation in and around area to the maximum extent possible.
- Minimize the creation of sites suitable for invasive species establishment.
- Minimize removal of roadside vegetation during construction, maintenance, and other ground disturbing activities.

Post-construction and Follow-Up

- Quickly treat individual invasive species plants or small infestations before they become established, produce seeds, and are able to spread.
- Suppress the growth and/or reduce the reproductive capabilities of invasive species to slow or prevent their establishment.

- Use certified weed free mulch and hay.
- Use only invasive species free sand, gravel, topsoil, etc.
- Consider the use of invasive species free fiber roll barriers or sediment logs.
- Consider whether a site requires seeding to insure that disturbed soil does not optimize invasive plant establishment.
- Revegetate using plant materials that have a high likelihood of survival.
- Use locally native material including seed mixes, plugs, and sods where appropriate and available. Use certified invasive species free products.
- Use appropriate seeding guidelines and mixes and realize that many species previously recommended for this purpose now present invasive problems. Cross reference seeding list with list of known or potential invasive species.
- Consider the appropriate seed transfer zones for the native plants used in various restoration projects within – wildlife, fisheries, etc. and follow guidance regarding use of locally native plants in restoration.
- Consider carefully if fertilization is warranted, because addition of fertilizer will increase risk and degree of invasive species invasion.

Invasive Species Monitoring

- Include monitoring and treatment for invasive species in project maintenance programs.
- After a ground disturbing activity, monitor infested areas annually for at least three growing seasons following completion of activities and provide for follow up treatments based on inspection results.
- Monitor and evaluate the success of revegetation in relation to project plan

ARCHEOLOGICAL RESOURCE CONCERNS

For any ground-disturbing activities being carried out under any of the proposed actions, the following BMPs will be followed with regards to archeological resources:

- NPS will include an archeologist in the detailed implementation planning for any ground-disturbing action.
- If warranted (i.e., high expectation of significant artifacts exists), NPS will conduct subsurface testing at sites to be disturbed.
- To the extent possible, sites of ground-disturbing activities will be shifted, if needed, to avoid disturbing any identified resources. In wooded areas to be cleared, NPS may choose to leave a specific stand of trees intact where appropriate, to preserve the integrity of buried archeological resources.

- During ground-disturbing activities, a qualified archeologist will monitor the actions and will have the authority to halt the action as needed if archeological resources are encountered.

- Should unexpected resources be discovered, NPS will assess their significance before determining how to proceed. Available courses of action in such a situation would include:

    - Cessation of the construction action until the site can be properly documented and excavated;

    - Relocation/realignment of the action to allow the archeological materials to remain in place.

APPENDIX C

TREES TO BE CONSIDERED FOR REFORESTATION EFFORTS

Appendix C: Trees to be Considered for Reforestation Efforts

Vicksburg National Military Park Environmental Assessment for Landscape Rehabilitation

Common Name	Technical Name	Habitat	Proposed for Wetland Revegetation
Box Elder	*Acer negundo*	forested area on the edge of an open field	X
Red Maple	*Acer rubrum*	disturbed; open	X
Southern Sugar Maple	*Acer barbatum*	disturbed; roadside	
Smooth Sumac	*Rhus glabra*	disturbed; roadside	
Pawpaw	*Asimina triloba*	Mesic forest along small stream	
American Holly	*Ilex opaca*	disturbed; open	
Deciduous Holly	*Ilex decidua*	mesic wooded area	
Ironwood or Blue Beech	*Carpinus caroliniana*	disturbed; roadside;forested mesic north slope	X
Black Haw	*Viburnum prunifolium*	mesic forested north slope	
Elderberry	*Sambucus canadensis*	disturbed;roadside; east facing slope;	X
Rusty Black Haw	*Viburnum rufidulum*	on east slope; along small stream; in forest.	
Flowering Dogwood	*Cornus florida*	disturbed; open	
Rough-leaved Dogwood	*Cornus drummondii*	disturbed; mesic	
Eastern Red Cedar	*Juniperus virginiana*	disturbed; open	
Persimmon	*Diospyros virginiana*	disturbed; roadside;forested mesic north slope	
Black Locust	*Robinia pseudo-acacia*	disturbed; roadside	
Honey Locust	*Gleditsia triacanthos*	disturbed; roadside	
Redbud	*Cercis canadensis*	mesic forested north slope	
Beech	*Fagus grandifolia*	mesic north slope; on stream	
Black Oak	*Quercus velutina*	disturbed; roadside;mesic north slope	
Cherrybark Oak	*Quercus pagoda*	disturbed; open	X
Chinkapin Oak	*Quercus muehlenbergii*	on edge of mesic woods	
Northern Red Oak	*Quercus rubra*	north slope; mesic drainage; in forested area	
Shumard's Oak	*Quercus shumardii*	disturbed; open	
Southern Red Oak	*Quercus falcata*	forested area on the edge of an open field	
Water Oak	*Quercus nigra*	mesic wooded area	X
White Oak	*Quercus alba*	disturbed; open	

Appendix C: Trees to be Considered for Reforestation Efforts

Vicksburg National Military Park Environmental Assessment for Landscape Rehabilitation

Common Name	Technical Name	Habitat	Proposed for Wetland Revegetation
Sweetgum	*Liquidambar styraciflua*	disturbed; open	X
Witch-hazel	*Hamamelis virginiana*	mesic forested north slope	
American Hydrangea	*Hydrangea arborescens*	very mesic north slope	
Oak-leaved Hydrangae	*Hydrangea quercifolia*	mesic forested north slope	
Bitternut Hickory	*Carya cordiformis (Wang.)*	mesic wooded area	
Black Walnut	*Juglans nigra L.*	mesic wooded area	
Pecan	*Carya illinoinensis*	disturbed; open	
Sassafras	*Sassafras albidum*	disturbed; forest edge/drainage	
Spice-bush	*Lindera benzoin*	in mesic forested northwest slope	
Southern Magnolia	*Magnolia grandiflora*	mesic wooded area	X
Tulip Tree or Yellow Poplar	*Liriodendron tulipifera*	disturbed; open	X
Red Mulberry	*Morus rubra*	mesic wooded area	
White Ash	*Fraxinus cf. americana*	disturbed; open	
Loblolly Pine	*Pinus taeda*	disturbed; roadside	
Sycamore	*Platanus occidentalis*	disturbed; roadside	X
Carolina Buckthorn	*Frangula caroliniana*	mesic wooded area	
Carolina Laurel Cherry	*Prunus caroliniana*	Mesic forest along small stream	
Chickasaw Plum	*Prunus angustifolia*	disturbed; roadside	
Wild Black Cherry	*Prunus serotina*	disturbed; mesic	
Black Willow	*Salix nigra*	Mesic forest along small stream	X
Eastern Cottonwood	*Populus deltoides*	disturbed; roadside	
Southern Buckthorn	*Bumelia lycioides*	disturbed; roadside	
Bald Cypress	*Taxodium distichum*	disturbed; open	
Basswood	*Tilia americana*	north slope; mesic drainage; in forested area	
American Elm	*Ulmus americana*	disturbed; open	
Slippery Elm or Red Elm	*Ulmus rubra*	disturbed; roadside;forested mesic north slope	
Southern Hackberry	*Celtis laevigata*	disturbed; mesic	X
Winged Elm	*Ulmus alata*	disturbed; roadside	

APPENDIX D

DRAFT VICKSBURG NATIONAL MILITARY PARK CULTURAL LANDSCAPE REPORT AND ENVIRONMENTAL ASSESSMENT WETLANDS STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11990 (PROTECTION OF WETLANDS)

DRAFT

Vicksburg National Military Park

Environmental Assessment for Landscape Rehabilitation

Statement of Findings for Executive Order 11990
(Protection of Wetlands)

February 17, 2009

Prepared for the National Park Service, U.S. Department of the Interior

by

MACTEC Engineering and Consulting, Inc.

Kennesaw, Georgia

STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11990
(PROTECTION OF WETLANDS)

Vicksburg National Military Park
Environmental Assessment for Landscape Rehabilitation

Recommended:

_____ _____
Ms. Monika Mayr, Superintendent Date

Vicksburg National Military Park

Certified for Technical Adequacy and Servicewide Consistency:

_____ _____
Chief, Water Resources Division Date

Approved:

_____ _____
Mr. David Vela, Regional Director Date

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1. INTRODUCTION

The National Park Service (NPS) has prepared and is making available for public review a Cultural Landscape Report (CLR) and Environmental Assessment (EA) that sets forth the basic philosophy for managing land cover at Vicksburg National Military Park (NMP) and provides a framework for future decision making on this subject. Two of the alternatives considered in the EA would have adverse effects on wetlands. Accordingly, the NPS has prepared this Statement of Findings in compliance with the requirements of Executive Order (EO) 11990 ("Protection of Wetlands"), which requires the NPS and other Federal agencies to evaluate the likely impacts of their actions on wetlands.

Vicksburg NMP is located in Vicksburg, Warren County, Mississippi (Figure 1-1). The park consists of six noncontiguous parcels. These include the main battlefield unit, Louisiana Circle, South Fort, Navy Circle, Grant's Canal, and Pemberton's Headquarters. Vicksburg National Cemetery abuts the park and is administered by NPS.

The purpose of Vicksburg NMP (NPS, 1980) is the:

> *"preservation and protection of existing earthworks, fortifications, structures, monuments, memorials, and other outstanding natural and historical features within its jurisdiction in such a way as to provide the visitor with a pleasing and rewarding experience. It is also to further the visitor's understanding and appreciation of the ordeal experienced by all persons of both North and South at Vicksburg during the months of May, June, and July 1863."*

Vicksburg NMP and Vicksburg National Cemetery comprise 1,800 acres. The park includes approximately 1,330 monuments, 16 miles of tour roads, and many earthen fortifications that document the components of the Union and Confederate armies during the siege. NPS faces many challenges associated with the long-term management and maintenance of the park. As part of the planning process intended to support decisions regarding management of the park, NPS is preparing a CLR for Vicksburg NMP. The CLR is intended to provide NPS with an assessment of the character-defining features of the Vicksburg NMP landscape, document historic and existing conditions, and develop specific treatment recommendations to ensure the future protection of the park and its natural and cultural resources (NPS, 2008). The main battlefield unit (Figure 1-2) is the primary focus of the CLR although the three small forts along the Mississippi River – South Fort, Louisiana Circle, and Navy Circle – are also addressed in the report. Landscape treatments are also proposed at South Fort. The EA will analyze the preferred alternative and the other proposed alternatives in the CLR and their impacts on the environment.

Today, the Vicksburg battlefield bears little resemblance to the landscape at the time of the siege. NPS management practices since the establishment of the park have allowed parklands to be naturally reforested. Areas that were once cleared during the siege are now forested as a result of natural vegetative regeneration and plantings by the Civilian Conservation Corps (CCC) in the 1930s to minimize soil erosion. These areas now provide important wildlife habitat in a unique loess soil bluff environment. If landscape treatments described in the EA are not implemented, the existing park will continue to misrepresent historic battlefield landscape conditions and will reduce visitor understanding of the events that the park commemorates (NPS, 2008).

Figure 1-1 Vicksburg National Military Park Site Location Map

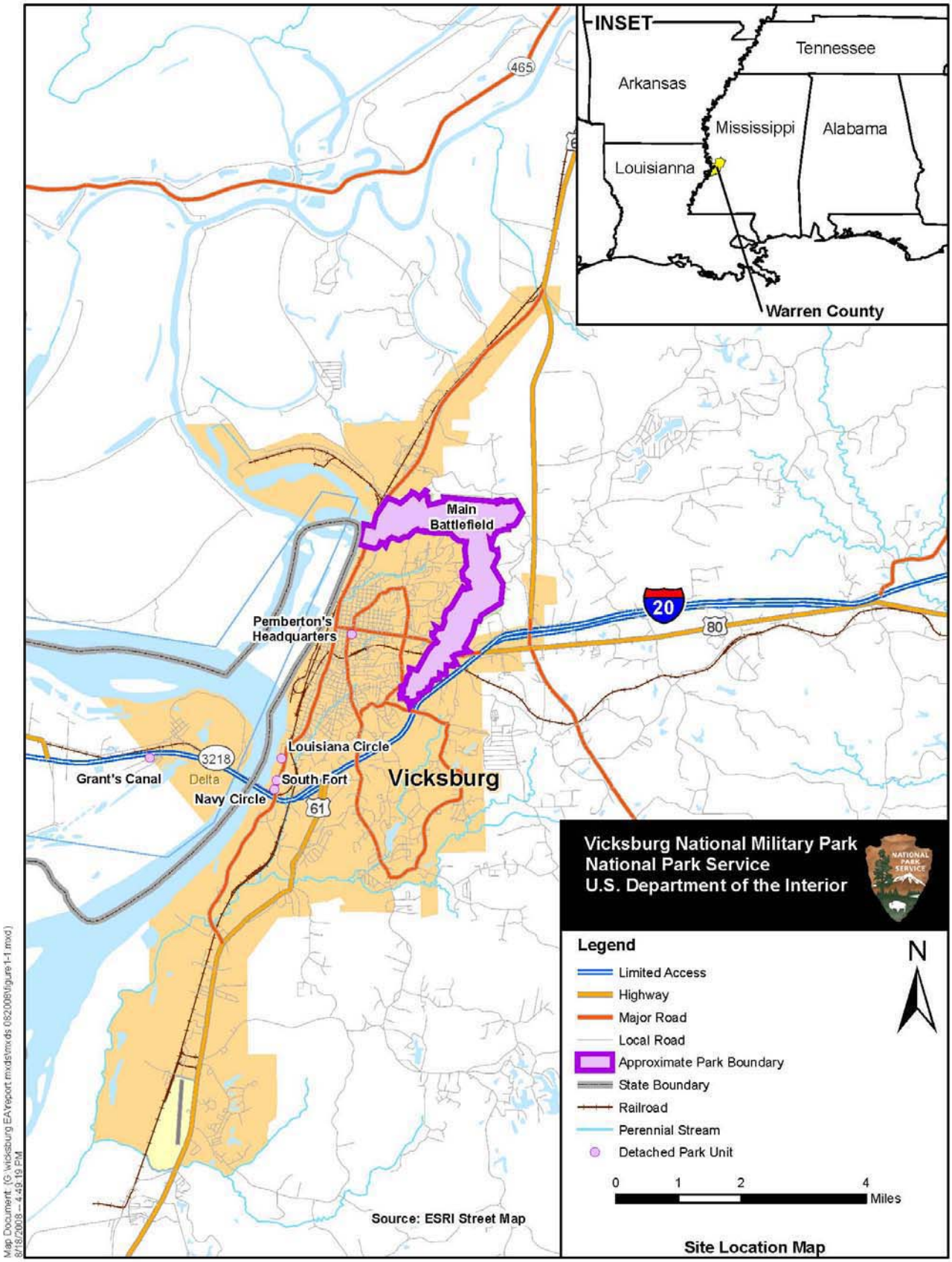


Figure 1-2 Vicksburg National Military Park Main Battlefield Areas

The CLR will also be used in support of an updated parkwide General Management Plan (GMP), a Comprehensive Long-range Interpretive Plan, and associated compliance as required by the National Environmental Policy Act (NEPA) of 1969, as amended. It will also be used to guide any additional landscape treatments beyond the initial landscape treatments discussed in the CLR. The GMP and Comprehensive Long-range Interpretive Plan are essential tools that will help guide future management of the park's resources (NPS, 2008).

EO 11990 ("Protection of Wetlands") requires the National Park Service and other Federal agencies to evaluate the likely impacts of their actions on wetlands. The objectives of the EO are to avoid, to the extent possible, the long-term and short-term adverse impacts associated with the occupancy, modification, or destruction of wetlands. NPS Management Policies (2006) and Director's Order 77-1, "Wetland Protection" (NPS 2002) reiterates the importance of safeguarding wetlands. NPS Procedural Manual #77-1 provides agency-specific procedures for complying with the EO. The purpose of this Statement of Findings is to present the rationale for undertaking a project with potential adverse impacts to wetlands and to document the anticipated effects.

EO 11988 ("Floodplain Management") requires the NPS and other federal agencies to evaluate the likely impacts of actions in floodplains. The objective of EO 11988 is to avoid, to the extent possible, the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. NPS Director's Order #77-2 Floodplain Management and Procedural Manual #77-2 provide NPS policies and procedures for complying with EO 11988. The proposed project would have no adverse effect to known floodplain areas. The only Federal Emergency Management Agency (FEMA)-designated floodplains within Vicksburg NMP are in the northwest corner of the park where Mint Spring Bayou enters the Yazoo River Diversion Canal. None of the proposed alternatives would result in any impacts to the designated floodplain in this area. Therefore, guidance under Director's Order 77-2 would not apply to the proposed project.

2. PROPOSED ACTION

The purpose of the CLR is to guide landscape treatment and maintenance so that the park meets its mandate to "commemorate the campaign, siege and defense of Vicksburg, and to preserve the history of the battles and operations of the siege and defense on the ground where they were fought and were carried on. …" The park's authorizing legislation further includes specific actions to meet the overall purpose: "to restore the forts and the lines of fortification, the parallels and approaches of the two armies, or so much thereof as may be necessary to the purposes of the park." The CLR seeks to provide a clear direction to manage the landscape in ways that commemorate the campaign, siege, and defense of Vicksburg, as required by Congress, by preserving resources and enhancing visitor understanding and appreciation of the events that occurred here while providing a variety of experiences and complying with other laws and regulations.

Four alternatives were evaluated as a part of the EA and are outlined below. Under the preferred alternative (Alternative C), the proposed action would reveal the historic landscape of the Civil War siege in the areas that collectively represent physical resources at key military engagement sites. At the time of the battle, the project areas consisted of fields, pasture, and meadows that were modified by military fortifications. During the 1863 siege, the landscape had been cleared of most forested areas. Trees were removed to establish clear fields of fire from Confederate earthworks, to construct additional fortifications and structures by both Union and Confederate forces, and to construct abatis (improvised obstacles) to impede the movement of Union forces.

The openness that characterized this area in 1863 persisted until the early 1900s. However, plantings by the CCC in the 1930s to minimize soil erosion and natural vegetation regrowth have established forested areas in these once open fields. The EA examines alternatives that involve rehabilitation of significant large-scale elements of the park's historic landscape, including the pattern of open fields and wooded areas. Rehabilitation would remove mature trees (60 to 80 feet tall) and replace them with grassed fields. Within riparian corridors, the mature trees would be replaced with a woody buffer consisting of low growing native trees and shrubs species (less than 15 feet tall). Vegetation that is less than 15 feet tall would be allowed to remain in the riparian area. Vegetation would be maintained by trimming to keep vegetation heights within wetlands and riparian areas below 15 feet. Removal of the non-historic vegetation would more accurately portray the historic avenues of approach and fields of fire that were important to the siege of Vicksburg.

ALTERNATIVES CONSIDERED BY THE EA

Four draft alternatives were developed during a November 2007 workshop with the project team. A full range of reasonable alternatives was developed, meeting the park's purpose and objectives for taking action and meeting NPS guidelines for providing different means of accomplishing park goals while protecting and/or minimizing impacts on some or all resources. Furthermore, the draft alternatives are consistent with applicable laws, policies, and regulations that guide NPS. The alternatives under consideration are listed below:

- Alternative A – Continue Existing Management (No Action)
- Alternative B – Preservation Through Best Management Practices (BMPs)
- Alternative C – Rehabilitate/Maintain Key Areas of Military Engagement
- Alternative D – Rehabilitate/Maintain the Broad Spectrum of Military Engagements

Two additional alternatives were considered but dismissed because they were determined to be unreasonable. Alternatives that were considered but dismissed are briefly discussed at the end of this section.

The no action alternative, Alternative A, would maintain the existing interpretive exhibits and landscape condition in the park. The three action alternatives include different ways of making the cultural

landscape and the story of Vicksburg more accessible to park visitors through a variety of interpretive programs, including technology and media exhibits and through clearing of the landscape. Alternative B (preservation through BMPs) focuses on technology and media exhibits as an important means of visitor interpretation, as well as protecting the existing cultural landscape through implementation of BMPs. Alternative C (rehabilitate/maintain areas of key military engagements) and Alternative D (rehabilitate/maintain the broad spectrum of military engagements) focus on clearing of the cultural landscape as a primary means of interpretation. Alternative C involves clearing in three key areas of activity during the siege, totaling approximately 90 acres, while Alternative D involves clearing of a broader area of military activity totaling approximately 350 acres.

These three action alternatives and the no action alternative were evaluated using a process called "Choosing by Advantages" (CBA) during meetings at Vicksburg NMP on June 24-25, 2008. This process evaluated alternatives by identifying and comparing the relative advantages of each according to a set of criteria. The alternatives were rated on how well they met following attributes and factors or had an advantage in meeting each attribute and factor:

- facilitating understanding and interpretation of the park story
- allowing visitors to experience history up close
- protecting physical features and resources from degradation
- providing opportunities for a variety of visitor experiences while maintaining the historic character and integrity of the landscape and managing visitor use conflicts
- protecting physical features from degradation
- developing sustainable ways of maintaining the landscape;
- protecting natural and cultural features relative to their place in achieving the purpose of Vicksburg NMP

Alternative C received the highest score of the four alternatives evaluated, and it is the NPS-preferred alternative. Alternative C provides the widest range of benefits to park visitors, the natural and cultural environments, and park maintenance, with minimal environmental degradation. Alternative A does not meet the purpose and need of the EA. Alternative B provides a variety of visitor use experiences, but it does not expose the cultural landscape of the siege activities so that the visitor can understand the Vicksburg campaign. Alternative D reveals more of the cultural landscape than does Alternative C, but it does so at the expense of park natural resources, including extensive wetland/stream impacts.

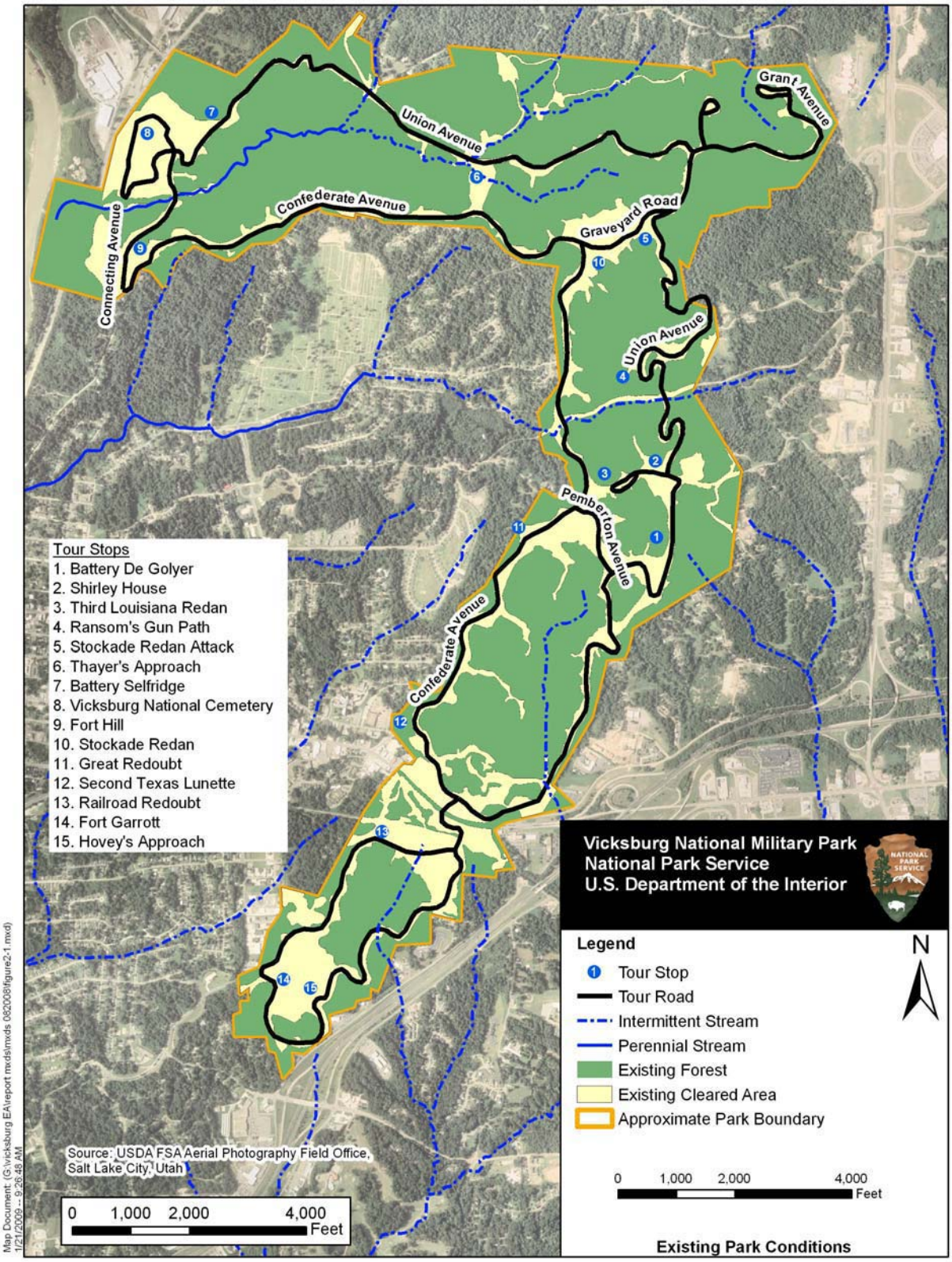
No impacts to wetlands and streams are proposed under Alternatives A and B. Alternative C would result in short-term and long-term adverse impacts to approximately 7 acres of forested wetlands as a result of their conversion from forested wetlands to scrub-shrub and emergent wetlands. Alternative D would result in short-term and long-term adverse impacts to approximately 97 acres of forested wetlands as a result of their conversion from forested wetlands to scrub-shrub and emergent wetlands.

Detailed descriptions of each of the alternatives follow. More detailed descriptions of the individual elements of each alternative and analyses of their proposed effects to the natural and human environments can be found in the EA prepared for the EA.

ALTERNATIVE A – CONTINUE EXISTING MANAGEMENT (NO ACTION)

The no action alternative describes the action of continuing the current management operations and conditions. It does not imply or direct any change to current management or the removal of existing uses, development, or facilities. The no action alternative provides a basis for comparing the management direction and environmental consequences of the action alternatives. Should the no action alternative be selected, NPS would respond to future needs and conditions associated with Vicksburg NMP without major actions or changes in present course. Figure 2-1 presents the existing park conditions, including the currently forested and cleared areas of the park.

Figure 2-1 Existing Park Conditions



ALTERNATIVE B – PRESERVATION THROUGH BMPS

Alternative B would preserve resources by applying BMPs to areas within the park. Interpretation would become the primary means for commemoration and communication of the site history to the visitor. This alternative would involve the development of new exhibits, waysides, signage and other interpretive features at different locations around the park. Also, three 10-acre sites would be converted to a new landcover type intended to best protect against soil erosion based on the recommendations of local ecologists and plant scientists. These sites would be monitored, and the approach adapted based on evaluation of the success of the resulting plant communities. Additional areas of the park would then be converted over time using this adaptive approach. It is anticipated that the alternative would not impact wetlands or riparian areas.

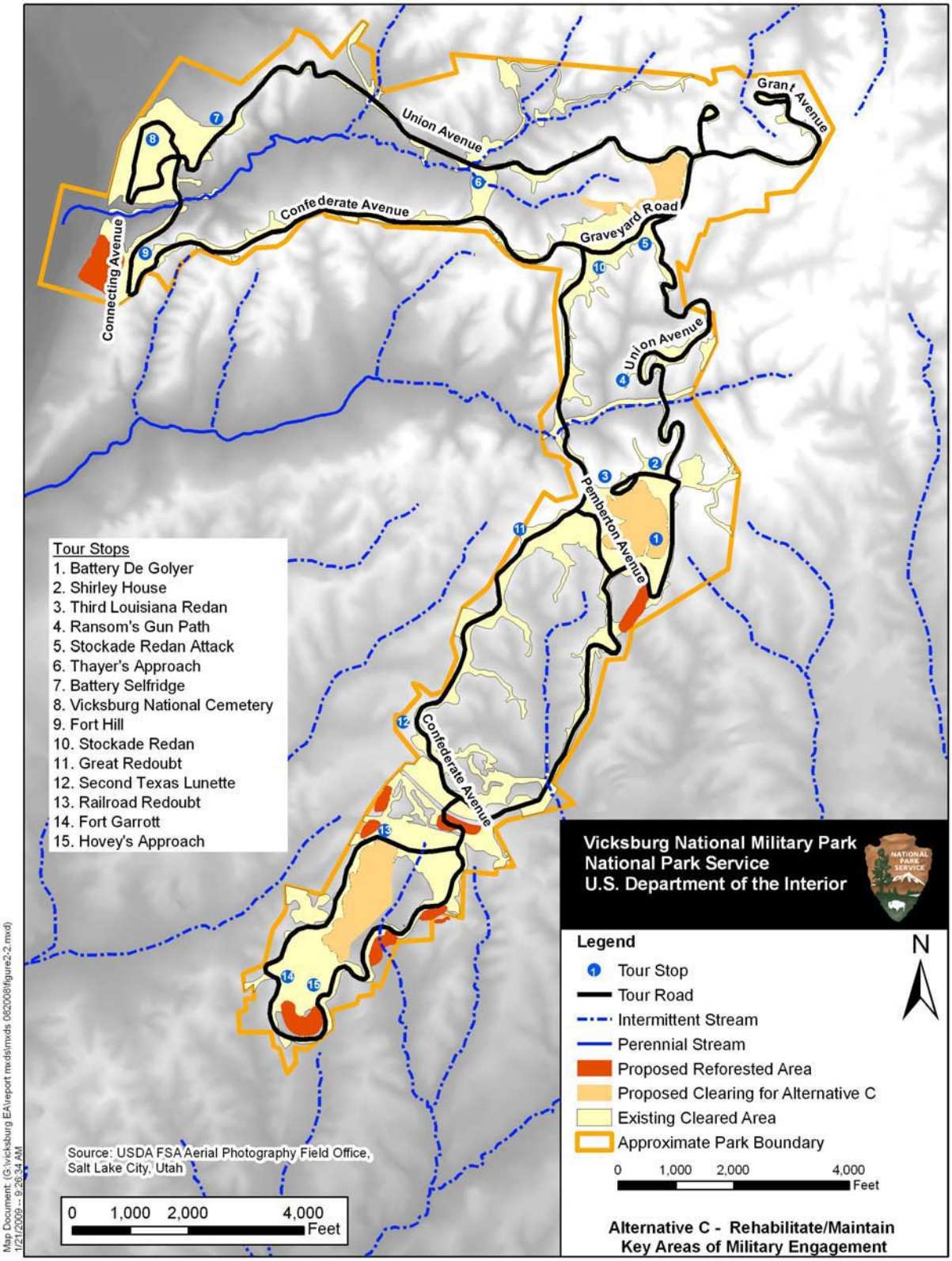
ALTERNATIVE C – REHABILITATE/MAINTAIN KEY AREAS OF MILITARY ENGAGEMENT

Under Alternative C, Vicksburg NMP would rehabilitate the park landscape, primarily by rehabilitating Civil War military resources. Alternative C would implement land cover changes within the park to reveal the historic landscape of the Civil War siege in the areas that collectively represent physical resources at key military engagement sites for meeting the legislative mandate of the park to "commemorate the campaign and siege and defense of Vicksburg," and "restore the forts and the lines of fortifications, the parallels and the approaches of the two armies, or so much thereof as may be necessary to the purposes of the park." Identification of the key areas was based on careful review and understanding of the military terrain that molded the events of September 1862 through July 1863 and its ability to convey the full range of important military events and activities that occurred there. Preservation and stabilization of important natural, cultural, and historic resources are assumed under rehabilitation. Rehabilitation accommodates new uses and can make historic associations more apparent. Furthermore, enhanced interpretive, park operations, and visitor use and experience elements would be included in Alternative C.

As shown in Figure 2-2, the key areas that would be considered priorities for maintaining open vegetative cover or where enhanced views and access are highly desirable to meet the park's mission of telling the story of the siege and attacks are:

- Area 1 – Old Jackson Road/Battery DeGolyer/Third Louisiana Redan. Implementation of this alternative would provide improved sight lines in this area. It would also benefit the cultural landscape by removing the old Administration Building. Removal would be addressed by the park in a future planning process. Clearing in this area would reveal Union earthworks, existing markers, key Union avenues of approach, and battlefield terrain that are currently obscured from view in the forested area between Confederate earthworks to the west and Union earthworks to the east. Union trench lines are contained within the forested area and are currently not visible from the Confederate earthworks and fortifications that they approached during the siege. Clearing in this area would also provide connectivity between existing cleared battlefield areas. No wetlands or streams are located within this proposed clearing area.
- Area 2 – Railroad Redoubt/Fort Garrott. Clearing in this area would reveal Union earthworks, existing markers, and battlefield terrain that are currently obscured from view in the forested area between Railroad Redoubt to the north and Fort Garrott to the south. Confederate earthworks are currently visible adjacent to the western edge of the proposed clearing limits along the South Loop Tour Road. Some Union earthworks are also visible along the tour road to the east of the proposed clearing limits, but several Union trench lines are contained within the forested area and are currently not visible from the Confederate earthworks and fortifications that they approached during the siege. These trench lines, including existing markers installed during the early years of

Figure 2-2 Alternative C – Rehabilitate/Maintain Key Areas of Military Engagement



Vicksburg NMP that document the locations of Brig. Gen. Lawler's 2nd Brigade, 14th Division, and Col. Lindsey's 2nd Brigade, 9th Division under the XIII Army Corps and Major General John A. McClernand, are concealed from view within the forested areas proposed to be cleared. Natural resource challenges include gley soils (soil that has been saturated over a long period of time, therefore reducing the iron and manganese content) and wetland areas.

- Area 3 – Graveyard Road/Stockade Redan. This area is the best place to tell the story of combat; the May 19 to 22, 1863, attacks; the construction methods and components of Stockade Redan; and a key Union avenue of approach. Natural resource challenges include wetlands, heavy forest, and Mint Spring Bayou.

Alternative C would enhance the visual accessibility of these three key areas of the battlefield landscape by removing approximately 90 acres of existing forest cover and replacing it with a low-growing groundcover. The alternative would retain older native trees where they do not block important views, particularly those that afford shade along the tour road.

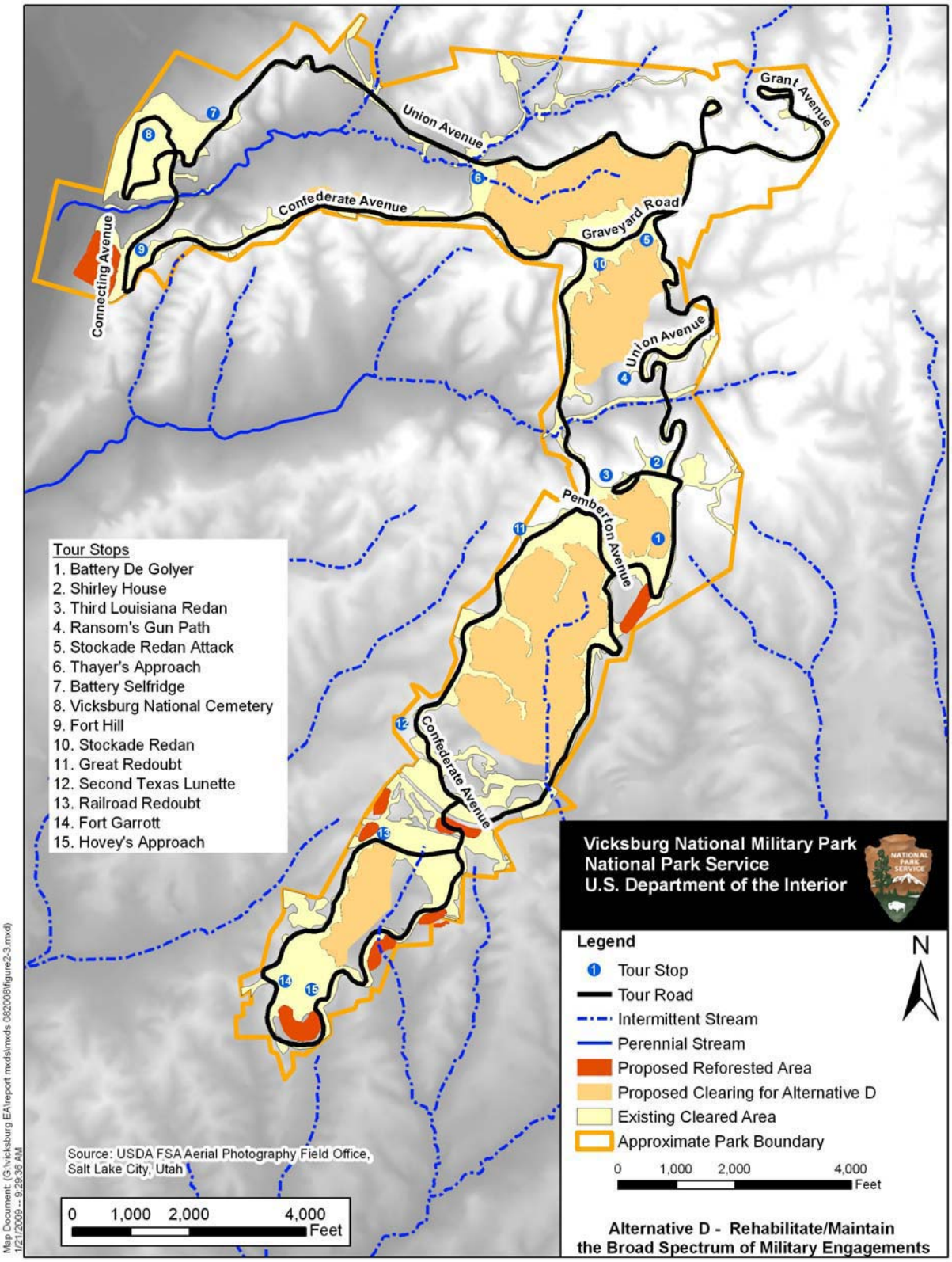
Alternative C would also include the re-establishment of spatial patterns associated with the 1863 battlefield landscape within view of the tour road corridor, such as key visual connections between artillery positions of the opposing armies, fields of fire, and exposure of terrain features that can be tied to the military engineering of the two lines. This approach would prioritize interventions that enhance the experience of the visitor touring the park within a vehicle, as many visitors do. This alternative would incorporate a combination of judicious woodland clearing, thinning, and limbing up of canopy trees to enhance visual accessibility along the auto tour route. Alternative C would also establish new forest cover over 20 acres of the park to enhance screening of incompatible views and help protect the park's setting and critical viewsheds. Reforestation would involve the planting of tree, shrub, and groundcover species representative of a desired future woodland composition.

ALTERNATIVE D – REHABILITATE/MAINTAIN THE BROAD SPECTRUM OF MILITARY ENGAGEMENTS

Under Alternative D, an extensive area of Vicksburg NMP would be rehabilitated by the removal of woodlands to reveal a broad spectrum of sites of military engagement. Alternative D assumes that interpretation and education of visitors should feature authentic connections between physical resources and military events, using military terrain analysis as the basis for revealing the key stories associated with the Vicksburg landscape. Implementation of Alternative D would enhance the legibility of Civil War-era resources and associations through the removal of forest cover that has grown up since the end of the siege and currently obscures many visual and physical relationships that were important to the events that occurred at Vicksburg in 1863. Tree clearing would occur in areas identified through military terrain analysis as key to the battle and siege tactics of Union and Confederate commanders, and to its understanding. Interpretation would be provided to help visitors understand what happened within these modified areas. Later additions to the landscape that support visitor use of the park and NPS administration of the site, as well as late 19th and early 20th century commemoration of the Civil War, would be retained to interpret the park's enabling legislation. Alternative D assumes that the best way to "commemorate the siege and preserve the history of the battles and operations of the siege and defense on the ground where they were fought and were carried on …" is to reveal the landform, topography, and earthen fortifications associated with Union and Confederate lines and the landscape that was modified to offensive and defensive purposes between them.

As shown in Figure 2-3, the key areas that would be considered priorities for maintaining open vegetative cover or where enhanced views and access are highly desirable to meet the park's mission of telling the story of the siege and attacks are:

Figure 2-3 Alternative D – Rehabilitate/Maintain the Broad Spectrum of Military Engagements



- The extent of the Union and Confederate lines and the landscape between them between Thayer's Approach and Fort Garrott, with buffer plantings to be established or remain in association with the visitor center, maintenance area, and Clay Street.
- Clearing to expose a visual connection to the water battery from Fort Hill would be another localized effort that would support implementation of this alternative.
- Fort Hill and the landscape north and west of Thayer's Approach would not be cleared because there was little military activity in this area, and most of the park's forest and natural resources, wetlands, and Mint Spring Bayou exist within this area.
- However, forest would be retained in the area behind the Illinois Monument up to Old Jackson Road to protect the steeply sloped topography that could not otherwise be maintained, and to provide a visual screen for modern Jackson Road.

Alternative D would enhance the visual accessibility of the battlefield landscape by removing existing forest cover over approximately 350 acres, and replacing it with a low ground cover that does not interfere with visitor visual access of the enhanced areas. Bermuda grass, native grasses and forbs, and other groundcovers would be considered for establishment on newly cleared areas. The type of groundcover to be used in each area should be based on a park assessment of its facility in establishment and maintenance.

Alternative D would also establish new forest cover over 20 acres of the park to enhance screening of incompatible views and help protect the park's setting and critical viewsheds. Reforestation would involve the planting of tree, shrub, and groundcover species representative of a desired future woodland composition.

ALTERNATIVES CONSIDERED BUT DISMISSED

Two additional alternatives were considered but dismissed. The two alternatives were Alternative E – Restoration to Civil War Siege Period (circa 1863) and Alternative F – Restoration to Park Development Period (1899 to 1917). Implementation of either of these alternatives would require the re-acquisition of former parkland that has been heavily impacted by adjacent development. Both alternatives would require extensive tree clearing and replanting of ground cover. Extensive resources would be required to maintain the ground cover. Monumentation would be removed, and interpretive resources would be required at an alternative location. Exceptions would also have to be made for the inclusion of features that do not date to the specified restoration period, such as commemorative monuments and the visitor center, which would negate the guiding concept of the alternatives. Because these alternatives would require extensive clearing of existing and former NPS property, as well as the loss of existing interpretive features, they were dismissed as being not reasonable.

3. SITE DESCRIPTION

No impacts to wetlands and streams would occur under Alternatives A and B. The project area for Alternative C (the preferred alternative) encompasses approximately 90 acres and would result in short-term and long-term adverse impacts to approximately 7 acres of forested wetlands as a result of their conversion from forested wetlands to scrub-shrub and emergent wetlands. The project area for Alternative D encompasses approximately 350 acres of clearing and would result in short-term and long-term adverse impacts to approximately 97 acres of forested wetlands as a result of their conversion from forested wetlands to scrub-shrub and emergent wetlands. Figure 3-1 shows the proposed clearing areas for Alternatives C and D.

Within the project area, potential wetland impacts under Alternatives C and D would be to either riverine, upper perennial, unconsolidated bottom streams or palustrine forested wetlands. These areas are located within the Two-Mile Creek, Durden Creek, Glass Bayou, or Mint Spring Bayou watersheds, all of which are tributary to the Mississippi River or the Yazoo River Diversion Canal. These wetland types are common throughout the park and in the surrounding region, and within the park, the wetland communities include areas dominated by Chinese privet (*Ligustrum sinense*).

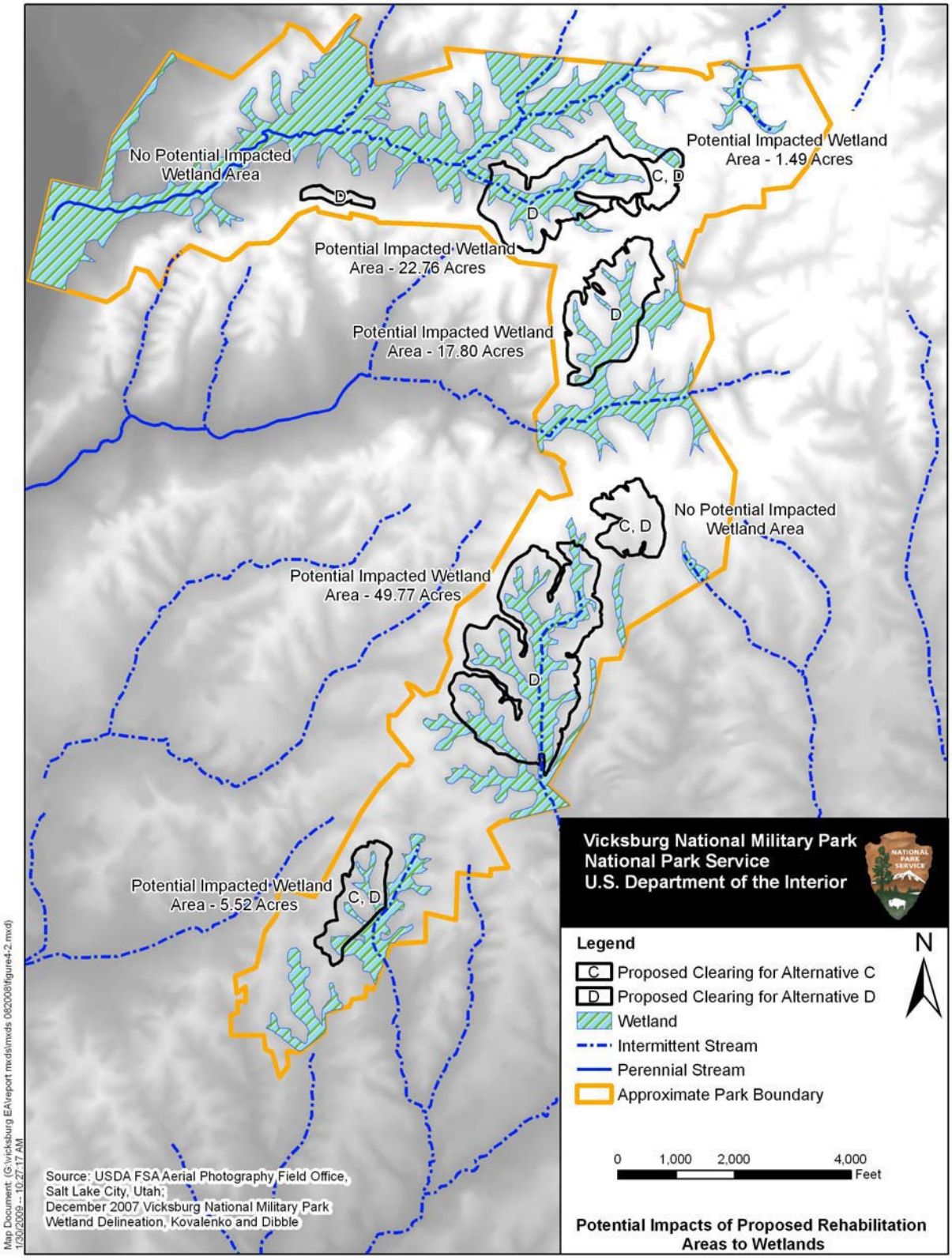
Potential impacts to wetlands from battlefield rehabilitation would involve clearing vegetation from 7.01 acres of forested wetland. Within a 50-foot buffer along streams (25 feet on each side), trees over 15 feet tall would be removed, while trees less than 15 feet tall would remain. This 50-foot streambank buffer would be replanted with native species as necessary to maintain woody vegetation along the streambanks. Vegetation in the buffer would be maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Outside of the 50-foot streambank buffer, wetland areas would be replanted with low-growing native grasses. Native woody vegetation would be allowed to naturally repopulate this area but maintained to a maximum height of 15 feet.

Information on the wetland systems is derived from a wetland delineation of Vicksburg NMP that was completed in December, 2007 (Kovalenko and Dibble, 2007). The principal investigators for the wetland delineation were Katya Kovalenko, a Ph.D. candidate of Aquatic Ecology in the Department of Wildlife and Fisheries at Mississippi State University, and Dr. Eric Dibble, a professor of Aquatic Ecology at Mississippi State University. This delineation report describes the hydrophytic plant communities, soil types, and hydrology of wetlands and streams in the park and classifies these wetland/stream areas within the Cowardin and hydrogeomorphic systems. The delineation report is included as Appendix A.

Functionally, forested wetlands in the park are defined as seepage or slope wetlands, which are recharged from rainwater that percolates from higher elevations and contributes to seepage, subsurface, and sheet flows. According to disturbance-level criteria, seepage and riverine wetlands in the park were judged pristine to moderately disturbed (primarily by upstream modifications and invasive plants), and modified wetlands were judged severely disturbed (Kovalenko and Dibble, 2007). Forested wetlands of the park may play an important role in control of erosion and siltation. Dense growth of Chinese privet may compromise this role and wetland functions; observations indicated very sparse herb and other shrub cover and lack of extensive root systems in gullies overgrown with privet, whereas nearby areas dominated by native giant cane (*Arundinaria gigantea*) had a more extensive root system in the upper part of the soil (Kovalenko and Dibble, 2007).

Water retention by seepage wetlands is essential for streamflow maintenance and integrity of the overall watershed. Saturated soils were observed in the park up to two months after the last significant precipitation was recorded (Kovalenko and Dibble, 2007). It is also possible that seepage wetlands prevent the soil from extreme desiccation, which may lead to changes in soil structure; therefore, this type of wetland is important for maintaining soil integrity and reducing erosion. (Kovalenko and Dibble, 2007).

Figure 3-1 Potential Impacts of Proposed Rehabilitation Areas to Wetlands



Biological functions of wetlands consist of maintenance of plant and animal communities and regional and landscape biodiversity. A variety of fish, macroinvertebrates, reptiles, and amphibians utilize the wetland and perennial stream habitats that would be cleared. Most of the proposed clearing would occur along intermittent and ephemeral stream channels, which would not maintain year-round populations of these animals. Several obligate wetland plants were observed in Vicksburg NMP during floristic assessment. Park wetlands have a relatively high habitat function. Vicksburg NMP contains one of the few remaining tracts of loess bluff hardwood forests on public land in the United States; therefore, some of the wetlands within the park support plant communities that are regionally rare. None of these areas are proposed to be cleared. No rare, threatened or endangered species are known to occur within the wetland areas. Some areas had lower habitat quality due to the presence of invasive species, especially English ivy and Chinese privet (Kovalenko and Dibble, 2007).

In total, there are four wetland systems evaluated within this document. The wetland areas and their proposed impacts from Alternatives C and D are as follows.

Table 3-1. Potential Impacts to Wetland Areas from Alternatives B, C, and D.

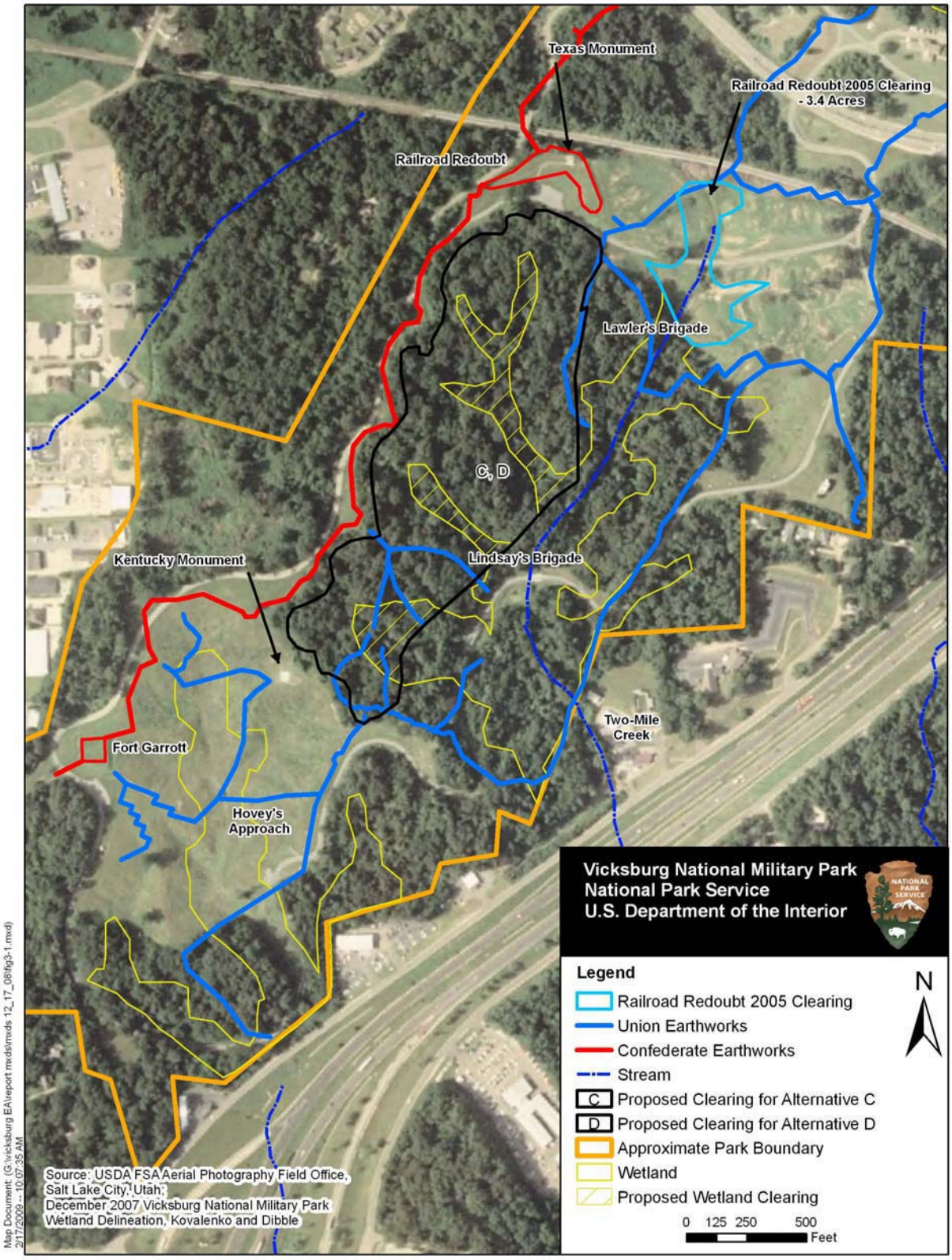
Wetland Area #	Potential Alternative B Wetland Impacts (acres)	Potential Alternative C Wetland Impacts (acres)	Potential Alternative D Wetland Impacts (acres)
(1) Two-Mile Creek Area	none	5.52	5.52
(2) Durden Creek Area	none	none	49.77
(3) Glass Bayou Area	none	none	17.60
(4) Mint Spring Bayou Area	none	1.49	24.25
TOTAL	none	7.01	97.14

TWO-MILE CREEK AREA (1).

Two-Mile Creek and its adjacent tributaries and wetlands are located near the southern boundary of Vicksburg NMP in an area known as the South Loop (Figure 3-2). Approximately 2,400 linear feet of Two-Mile Creek, its unnamed ephemeral and intermittent tributaries, and adjacent wetland areas are located within the proposed clearing limits for Alternatives C and D. Both Alternatives C and D would convert the existing overstory vegetation from approximately 60-80 feet high to approximately 15 feet high. The Cowardin *et al* (1979) classification for Two-Mile Creek is riverine, intermittent, streambed, seasonally flooded. The associated wetlands within the proposed clearing area total 5.52 acres and are classified as palustrine forested, broad-leaved deciduous, and seasonally flooded/saturated (PFO1B/C). Two-Mile Creek originates within park boundaries and flows generally to the south. The watershed sizes of impacts to the Two-Mile Creek tributaries are less than 20 acres each.

Species observed in the wetland during the delineation fieldwork included Chinese privet, Japanese honeysuckle (*Lonicera japonica*), muscadine (*Vitis rotundifolia*), boxelder (*Acer negundo*), sugarberry (*Celtis laevigata*), water oak (*Quercus nigra*), sweetgum (*Liquidambar styraciflu*a), and sand violet (*Viola affinis*) (Kovalenko and Dibble, 2007).

Figure 3-2 Two-Mile Creek Area



Replacement of the wetland forest with a maintained scrub-shrub forest with a maximum canopy height of 15 feet would diminish some functional values in this area. The 50-foot buffer along streams would be cleared of exotic vegetation and vegetation taller than 15 feet, while other vegetation would remain within the 50-foot streambank buffer. Streams would no longer be shaded by mature trees, potentially resulting in elevated water temperatures during and after vegetation removal. A reduction in the amount of organic plant material entering the stream ecosystem may occur with the removal of larger trees. Removal of the larger trees would reduce the opportunity for adding large woody debris to the stream channels, which is an important component of a healthy stream system (Kovalenko and Dibble, 2007).

The conversion of forested wetland to native grasses and scrub-shrub areas may alter the faunal community that uses the area. Wildlife that prefer forested wetlands would relocate to other adjacent areas that remain forested, while species that prefer open or scrub-shrub wetland habitats would utilize the new habitats. The loss of mature trees would eliminate canopy cover, nesting, and food sources used by some wildlife species. During the short-term transition period immediately after tree removal, the reduced canopy cover would likely increase soil and water temperatures, which may be harmful to fish, reptiles, amphibians, and other water dependent wildlife. However, because the streams in this area are ephemeral and intermittent, the impacts to aquatic fauna utilizing this area are expected to be minimal. During the short-term transition period there may be an increased potential for erosion of exposed soils.

As with many of the riparian areas within the park, the wetlands in this area have become dominated by Chinese privet, an invasive species that the park is currently attempting to control. Clearing in this area would allow for the removal of privet and the re-establishment of native wetland and riparian species within the cleared areas. Photos 3-1 and 3-2 document the existing conditions of the Two-Mile Creek tributaries.

Other areas outside of the proposed clearing limits have been cleared recently to expand the viewshed between the Confederate and Union earthworks. To the south, woodlands and wetlands were cleared in 1998 to reveal the military terrain from Fort Garrott and along Hovey's Approach (Photo 3-3).

More recently, the Railroad Redoubt area, north of and adjacent to the proposed clearing area, was rehabilitated in 2005 to highlight an area of intense fighting on May 22, 1863, the only location where Union troops were temporarily able to penetrate the Confederate earthworks (Figure 3-2). Approximately 3.4 acres of wetlands were cleared during this rehabilitation. Prior to clearing, the wetland habitats and functions in this area were the same as those described above for the Two-Mile Creek area. The proposed clearing in the Two-Mile Creek area would further reveal the terrain in this area, allowing park visitors to see from Railroad Redoubt southward along the battlefield to Fort Garrott, similar to the actual conditions present during the siege. These clearings address the project purpose and need by facilitating understanding and interpretation of the park story.

DURDEN CREEK AREA (2).

Durden Creek and its adjacent tributaries and wetlands are located north of the visitor center and maintenance facility, between Union Avenue and Confederate Avenue (Figure 3-3). Over 10,000 linear feet of Durden Creek, its unnamed ephemeral and intermittent tributaries, and adjacent wetland areas are located within the proposed clearing limits for Alternative D. Alternative D would convert the existing overstory vegetation from approximately 60-80 feet high to approximately 15 feet high. No clearing of the Durden Creek area is proposed under Alternative C (the preferred alternative). The Cowardin *et al* (1979) classification for Durden Creek is riverine, perennial, streambed, seasonally flooded. The associated wetlands within the proposed clearing area total 49.77 acres and are classified as palustrine forested, broad-leaved deciduous, and seasonally flooded/saturated (PFO1B/C). Durden Creek originates within park boundaries and flows generally to the south. The watershed size of Durden Creek at the proposed clearing area is approximately 230 acres.

Photograph 3-1 Ephemeral Stream in Two-Mile Creek Area.

Note marker showing location of Illinois 97th Infantry. View looking west.

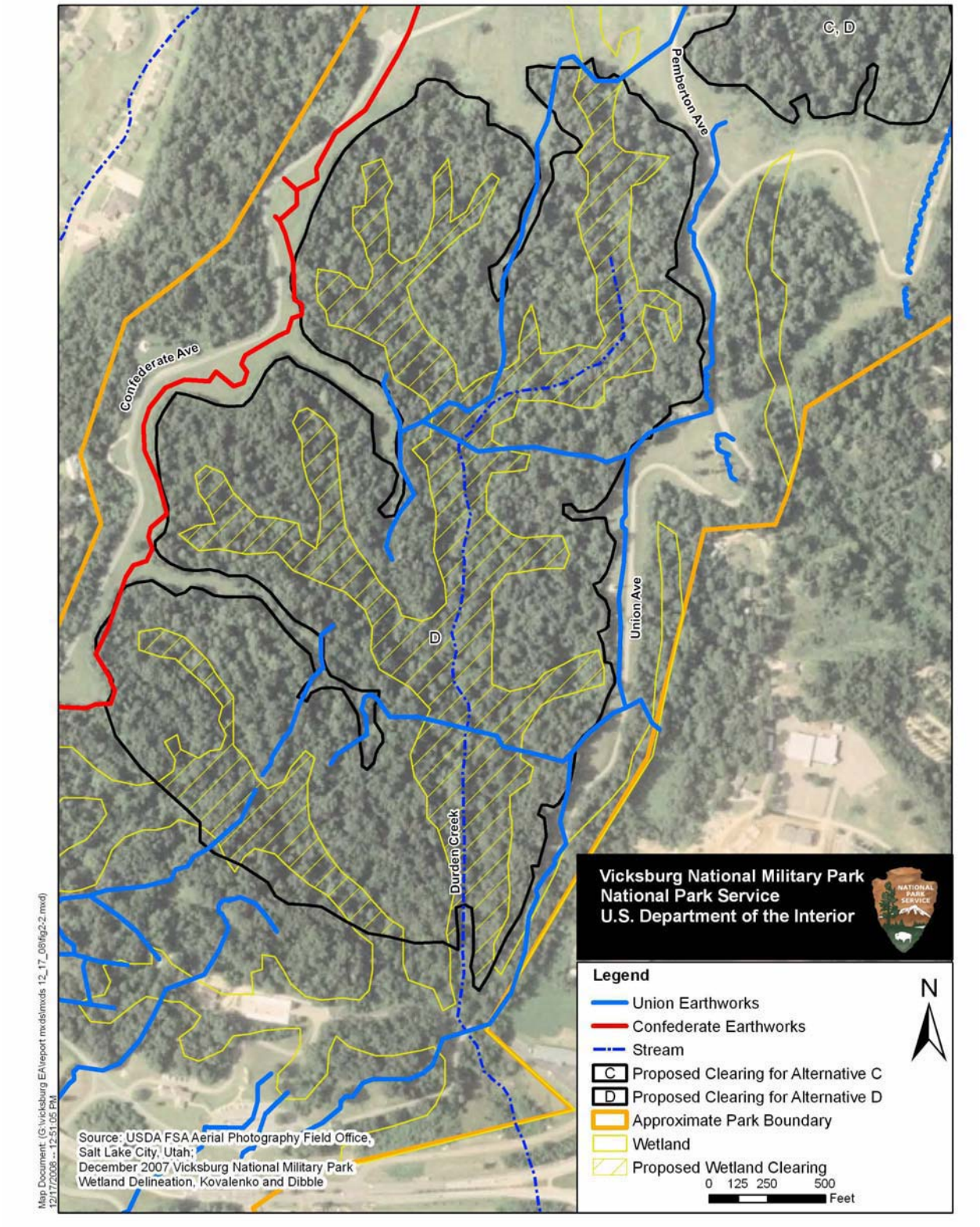
Photograph 3-2 Intermittent Stream in Two-Mile Creek Area.

Note thick privet in stream overbanks. View looking south.

Photograph 3-3 View from Kentucky Monument to Fort Garrott.

Fort Garrott visible in distance to right in photo. Area cleared in 1998. View looking southwest.

Figure 3-3 Durden Creek Area



Species observed in the wetland during the delineation fieldwork included Chinese privet, sycamore (*Platanus occidentalis*), boxelder, sweetgum, sugarberry, tulip tree (*Liriodendron tulipifera*), willow oak (*Quercus phellos*), flowering dogwood (*Cornus florida*), slippery elm (*Ulmus rubra*), giant cane, muscadine, Christmas fern (*Polystichum acrostichoides*), poison ivy (*Toxicodendron radicans*), violet (*Viola floridiana*), and sand violet (Kovalenko and Dibble, 2007).

Under Alternative C (the preferred alternative), this area would not be impacted. Under Alternative D, impacts to wetland and stream functions are consistent with those previously described for Two-Mile Creek. This area also contains Durden Creek, a perennial stream, which would maintain year-round populations of aquatic fauna. Impacts to the aquatic fauna in Durden Creek would be minimized by maintaining a 50-foot buffer along the creek with vegetation less than 15 foot tall.

The wetlands in this area have become dominated by privet. Clearing in this area would allow for the removal of privet and the re-establishment of native wetland and riparian species within the cleared areas. Removal of exotic plants allows for the regrowth of native vegetation, which benefits fauna using the wooded areas. Photos 3-4 and 3-5 document the existing conditions of Durden Creek and its tributaries.

Other areas outside of the proposed clearing limits are already cleared to show the viewshed between the Confederate and Union earthworks. To the north side of the proposed clearing, the Great Redoubt and Pemberton Avenue battlefields are maintained as clearings, and the larger scale of the battlefield terrain would be revealed by connecting this proposed clearing with the existing battlefield. Also, this clearing would connect with an additional proposed clearing area to the northeast that would not impact wetlands or streams.

GLASS BAYOU AREA (3).

Glass Bayou and its adjacent tributaries and wetlands are located just south of Graveyard Road, between Union Avenue and Confederate Avenue (Figure 3-4). Glass Bayou and its adjacent wetlands would not be directly impacted, but over 5,000 linear feet of unnamed ephemeral and intermittent tributaries to Glass Bayou and their adjacent wetland areas are located within the proposed clearing limits for Alternative D. Alternative D would convert the existing overstory vegetation from approximately 60-80 feet high to approximately 15 feet high. No clearing of the Glass Bayou area is proposed under Alternative C (the preferred alternative). The Cowardin *et al* (1979) classification for Glass Bayou is riverine, perennial, streambed, seasonally flooded. The associated wetlands within the proposed clearing area total 17.8 acres and are classified as palustrine forested, broad-leaved deciduous, and seasonally flooded/saturated (PFO1B/C). Glass Bayou originates to the east of Vicksburg NMP, outside of park boundaries, and flows generally to the west. The watershed size of Glass Bayou at the proposed clearing area is approximately 300 acres.

Species observed in the wetland during the delineation fieldwork included Chinese privet, boxelder, giant cane, sweetgum, American hornbeam (*Carpinus caroliniana*), Chinaberrytree (*Melia azedarach*), sycamore (*Platanus occidentalis*), tulip tree (*Liriodendron tulipifera*), eastern cottonwood (*Populus deltoides*), poison ivy, muscadine, and Virginia creeper (*Parthenocissus quinquefolia*) (Kovalenko and Dibble, 2007).

Under Alternative C (the preferred alternative), this area would not be impacted. Under Alternative D, impacts to wetland and stream functions are consistent with those previously described for Two-Mile Creek. This area also contains Glass Bayou, a perennial stream, which would maintain year-round populations of aquatic fauna. Impacts to the aquatic fauna in Glass Bayou would be minimized by maintaining a 50-foot buffer along the creek with vegetation less than 15 foot tall.

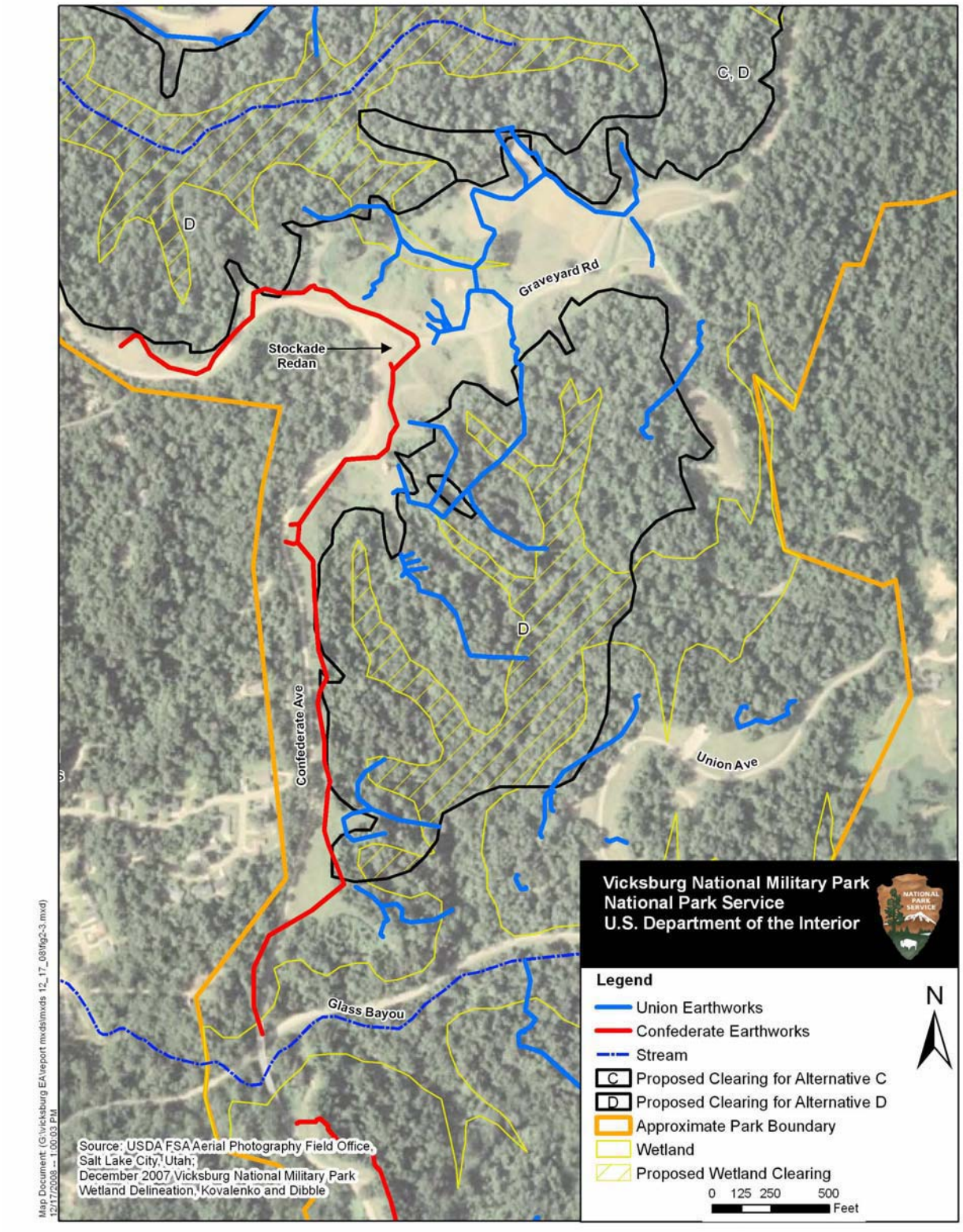
Photograph 3-4 View of Durden Creek from Union Avenue.

Looking downstream from Union Avenue bridge. Note thick privet in stream overbanks. View looking south.

Photograph 3-5 View of Durden Creek Tributary.

View looking east.

Figure 3-4 Glass Bayou Area



The wetlands in this area have become dominated by privet. Clearing in this area would allow for the removal of privet and the re-establishment of native wetland and riparian species within the cleared areas. Photos 3-6 and 3-7 document the existing conditions of the Glass Bayou tributaries.

Other areas outside of the proposed clearing limits are already cleared to show the viewshed between the Confederate and Union earthworks. To the north side of the proposed clearing, the Stockade Redan and Graveyard Road battlefields are maintained as clearings, and the larger scale of the battlefield terrain would be revealed by connecting this proposed clearing with the existing battlefield.

MINT SPRING BAYOU AREA (4).

Mint Spring Bayou and its adjacent tributaries and wetlands are located near the northern boundary of Vicksburg NMP (Figure 3-5). Mint Spring Bayou and its adjacent wetlands would not be directly impacted, but approximately 400 linear feet (under Alternative C) and over 5,000 linear feet (under Alternative D) of unnamed ephemeral and intermittent tributaries to Mint Spring Bayou and their adjacent wetland areas are located within the proposed clearing limits. Both Alternatives C and D would convert the existing overstory vegetation from approximately 60-80 feet high to approximately 15 feet high. The Cowardin *et al* (1979) classification for Mint Spring Bayou is riverine, perennial, streambed, seasonally flooded. The associated wetlands within the proposed clearing area of Alternative C (the preferred alternative) total 1.49 acres and within the proposed clearing area of Alternative D total 24.25 acres. These wetlands are classified as palustrine forested, broad-leaved deciduous, and seasonally flooded/saturated (PFO1B/C). Mint Spring Bayou originates to the east of Vicksburg NMP, outside of park boundaries, and flows generally to the west to its confluence with the Yazoo River Diversion Canal. The unnamed Mint Spring Bayou tributaries within the proposed cleared areas originate within park boundaries and flow generally to the west. The watershed size of the Mint Spring Bayou tributaries at the proposed clearing area is approximately 6 acres for Alternative C (the preferred alternative) and approximately 100 acres for Alternative D.

Species observed in the wetland during the delineation fieldwork included Chinese privet, tulip tree, boxelder, southern magnolia (*Magnolia grandiflora*), willow oak, muscadine, sweetgum, water oak, sycamore, bitternut hickory (*Carya cordiformis*), American hornbeam, slippery elm, and giant cane (Kovalenko and Dibble, 2007).

Impacts to wetland and stream functions are consistent with those previously described for Two-Mile Creek. This area also contains Mint Spring Bayou, a perennial stream, which would maintain year-round populations of aquatic fauna. Alternative C (the preferred alternative) would only impact intermittent and ephemeral tributaries to Mint Spring Bayou but would not impact the perennial portions of the larger stream. Impacts to the aquatic fauna in Mint Spring Bayou from Alternative D would be minimized by maintaining a 50-foot buffer along the creek with vegetation less than 15 feet tall.

The wetlands in this area have become dominated by privet. Clearing in this area would allow for the removal of privet and the re-establishment of native wetland and riparian species within the cleared areas. Photo 3-8 documents the existing condition of the Mint Spring Bayou tributaries.

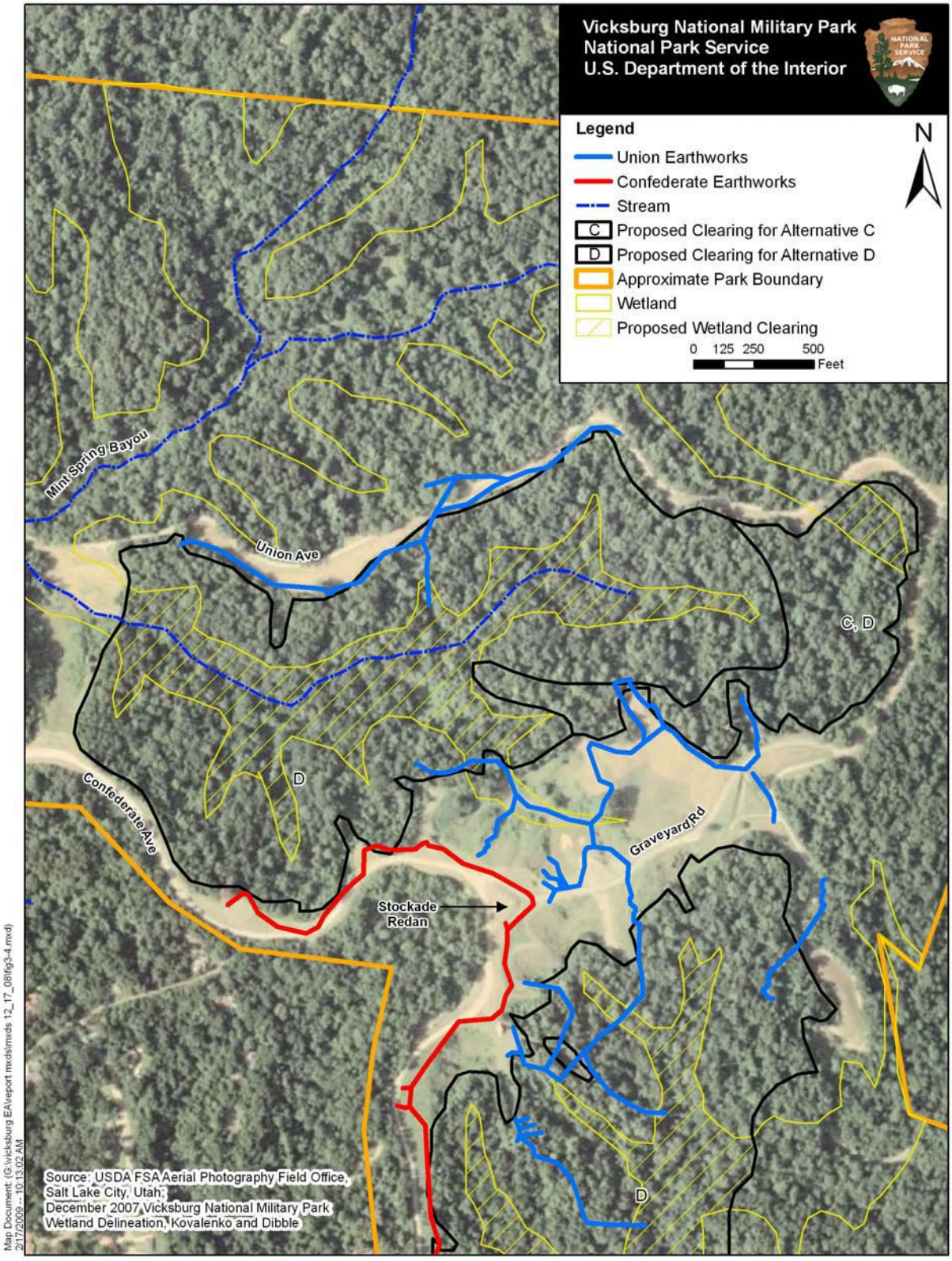
Photograph 3-6 View of Glass Bayou Tributary.

Note thick privet in stream overbanks. View looking south.

Photograph 3-7 View of Cleared Swale in Glass Bayou Area.

Confederate earthworks visible to right in photo, along Confederate Avenue. Proposed clearing would remove additional vegetation within this swale. View looking south.

Figure 3-5 Mint Spring Bayou Area



Photograph 3-8 View of Unnamed Mint Spring Bayou Tributary.

Note thick privet along stream banks. View looking east from Thayer's Approach.

Other areas outside of the proposed clearing limits are already cleared to show the viewshed between the Confederate and Union earthworks. To the south side of the proposed clearing, the Stockade Redan and Graveyard Road battlefields are maintained as clearings, and to the west, Thayer's Approach is maintained as a clearing showing the steepness of the Union approach to the Confederate earthworks. The larger scale of the battlefield terrain would be revealed by connecting this proposed clearing with the existing battlefield. The proposed clearing in the Mint Spring Bayou area would further reveal the terrain in this area, allowing park visitors to see across the battlefield to the location of the opposing army, more accurately representing the conditions present during the siege.

4. MITIGATIVE MEASURES

During the "Choosing by Advantages" process, Alternative C was selected as the preferred alternative because it meets the purpose and need of the EA while minimizing impacts to the natural and cultural environment, including wetlands. Alternative C would impact significantly less wetland area than Alternative D (7 acres versus 97 acres). Based on the selection of Alternative C as the preferred alternative, Vicksburg NMP would propose the following mitigation for impacts that would result from the implementation of Alternative C. These mitigation areas are shown on Figure 4-1.

The National Park Service finds that there are no practicable alternatives to altering approximately 7.01 acres of wetlands within the project area under Alternative C and that still meet park goals outlined in the EA. If the proposed areas are not cleared, Vicksburg NMP will continue to misrepresent historic battlefield landscape conditions and will reduce visitor understanding of the events that the park commemorates. Because portions of the historic battlefield contain wetlands and streams, the rehabilitation activities must accordingly be conducted within the wetland areas.

Potential impacts to wetlands from battlefield rehabilitation would involve clearing vegetation from 7.01 acres of forested wetland. Within a 50-foot buffer along streams (25 feet on each side), trees over 15 feet tall would be removed, while trees less than 15 feet tall would remain. This 50-foot streambank buffer would be replanted with native species as necessary to maintain woody vegetation along the streambanks. Native species to be replanted may include boxelder, red maple, American hornbeam, elderberry (*Sambucus canadensis*), water oak, southern magnolia, tulip tree, black willow (*Salix nigra*), sugarberry, sycamore, sweetgum and cherrybark oak (*Quercus pagoda*). Vegetation in this area would be maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Outside of the 50-foot streambank buffer, wetland areas would be replanted with low-growing native grasses. Native woody vegetation would be allowed to naturally repopulate this area but maintained to a maximum height of 15 feet.

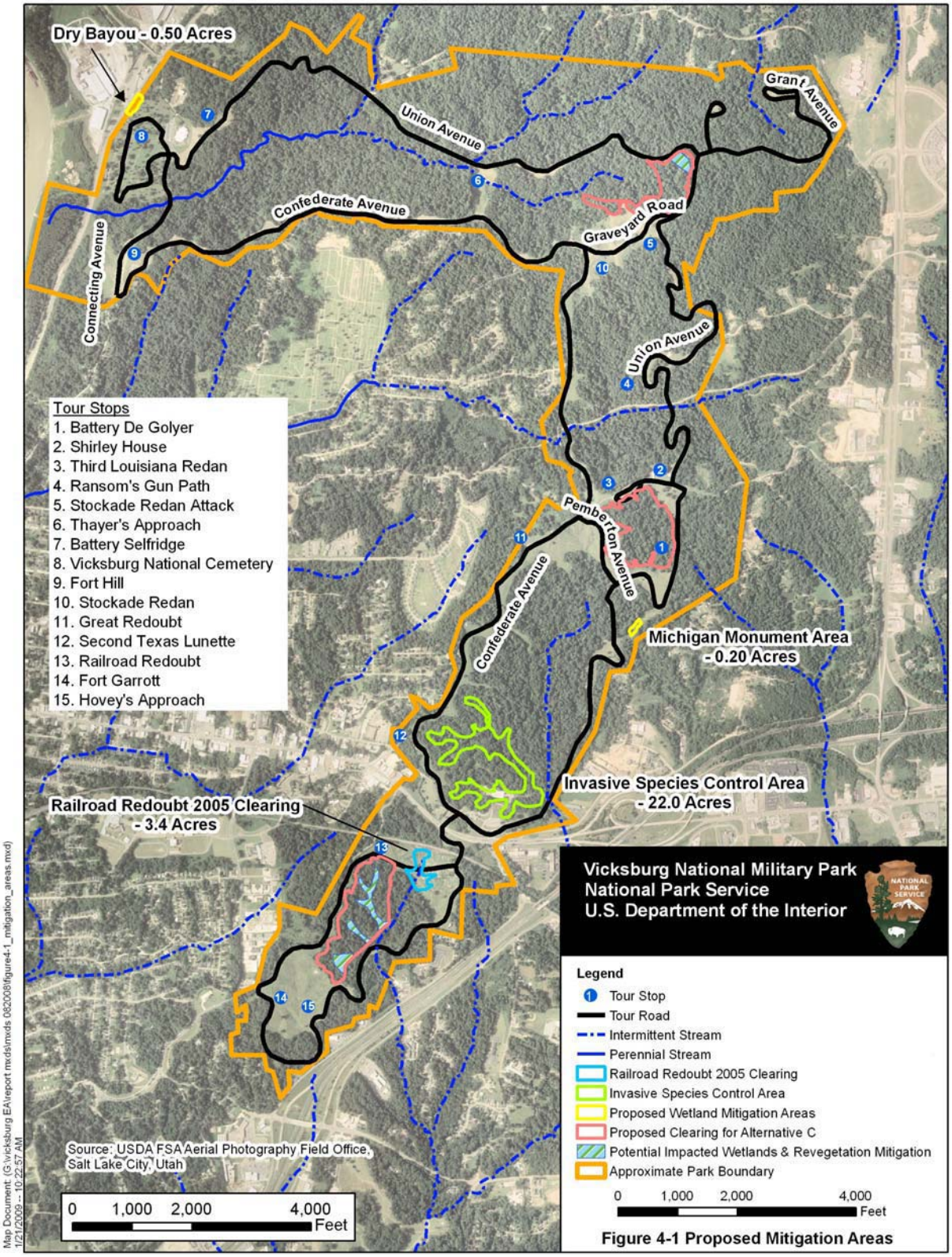
Additionally, Vicksburg NMP would mitigate for 3.4 acres of wetland areas that were impacted in 2005 during battlefield rehabilitation at Railroad Redoubt. The wetlands in this area were cleared during rehabilitation activities and are being allowed to naturally revegetate with native plants that occurred in the wetland prior to the clearing (species include black willow and boxelder). Thus, the proposed mitigation measures would account for the 7.01 acres of potential wetland impacts from Alternative C (the preferred alternative) and 3.4 acres from previous wetland impacts, for a total of 10.41 acres.

Proposed mitigation measure for impacts from the preferred alternative (Alternative C):

- After clearing, 7.01 acres of stream corridor and palustrine wetland in the Two-Mile Creek (Figure 3-2) and Mint Spring Bayou (Figure 3-5) areas outside of the 50-foot streambank buffer would be replanted to native grasses. Woody vegetation would be allowed to naturally regenerate in this area but maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Privet and other exotic species control in these areas would be conducted to avoid re-introduction of invasive species.

- A 50 foot buffer (25 feet per side) of native scrub/shrub vegetation would be maintained at 15-foot height or less along impacted stream corridors. Within the 50-foot streambank buffer, trees over 15 feet tall would be removed, while trees less than 15 feet tall would remain. The 50-foot streambank buffer would be replanted with native species as necessary to maintain woody vegetation along the streambanks. Vegetation in this area would be maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Native species to be replanted are listed above.

Figure 4-1 Proposed Mitigation Areas



- 0.20 acres of wetland currently maintained in herbaceous vegetation along Union Avenue downslope from the Michigan Monument would be replanted with native plant species (Photo 4-1). This area, cleared over 30 years ago and currently maintained as a grassed field, would be allowed to return to a forested wetland. Species to be replanted are listed above.

- Approximately 0.50 acres of a 1.16-acre parcel containing "Dry Bayou," a natural spring that has been disturbed by development, would be restored by removing debris, removing non-native vegetation, and replanting with native wetland plant species listed above. The spring is adjacent to the Vicksburg National Cemetery and was disturbed during construction of commercial facilities on the parcel. Vicksburg NMP acquired the "Dry Bayou" property in 2003.

- The park would conduct an exotic plant eradication on approximately 22.0 acres of forested wetlands in the Durden Creek watershed as shown on Figure 4-1. Privet and other invasive exotics would be removed from this area.

The total mitigation acreage proposed for potential impacts from Alternative C (the preferred alternative) is 29.71 acres. The proposed mitigation includes revegetation within the 7.01 acres to be cleared under Alternative C, and an additional 22.70 acres of wetland restoration and exotic species control in other wetland areas within the park. The mitigation measures are summarized below in Table 4-1.

Table 4-1. Preferred Alternative Proposed Mitigation Measures

Proposed Mitigation	Mitigation size (acres)
Planting of native grasses and privet control in cleared wetland areas	7.01 (includes stream buffer replanting)
50-foot stream buffer replanting area and privet control	Acreage included above
Restoration of Michigan Monument wetland area	0.20
Restoration of Dry Bayou wetland area	0.50
Exotic species control along unnamed Durden Creek tributary	22.0
TOTAL	29.71

Best management practices for vegetation removal in wetland areas would be followed. Vegetation removal in wetlands would be done by hand and motorized vehicle access into wetlands would be done on protective mats when necessary to avoid disturbing surface soils. Trees would be felled away from streams and wetlands. Where possible, stumps would be left in place within wetland areas and the cut stumps would be treated with an herbicide safe for use in riparian and wetland areas. Activities would be timed to minimize any impacts on wildlife species and wetlands (generally occurring during dry periods).

Stream crossings would be avoided when possible. However, in the event of any stream crossing metal plates or other suitable bridging material would span the width of the stream, from bank to bank, and all equipment and debris would be transported across the metal plates. This would reduce the potential for incidental sediment eroding into the streams.

Photograph 4-1 Cleared Wetland Downslope from Michigan Monument

Cleared area to be restored to native forest vegetation.

The currently anticipated schedule to implement the preferred alternative and proposed mitigation is to start the battlefield rehabilitation in approximately five years (2014). The clearing activity would be done in three phases, with each phase taking approximately one year to complete. The project would be completed within approximately three years (2017), contingent on available funding.

The wetlands mitigation would begin at the same time as the initiation of the battlefield clearing activities and would progress concurrently with the clearing. Based on the park's experience in other clearing activities within Vicksburg NMP, the cleared and converted wetlands would require approximately four years to become fully functional as scrub/shrub wetlands.

A detailed monitoring and contingency plan would be developed to ensure that erosion and sedimentation control and proposed wetland mitigation are successful and in compliance with Director's Order 77-1. At a minimum, the monitoring plan would be conducted for five years after vegetation removal and would collect information on vegetation development and abundance, species composition, survivorship, and natural recruitment. Information regarding species composition, abundance, and plant survival would document the success of the mitigation efforts, to include areal cover of desirable vegetation and survival of desirable species (planted and natural recruits) in the mitigation areas. Monitoring and maintenance of the wetland mitigation areas would begin once the wetland areas have been cleared and would be implemented as an ongoing park maintenance activity. Maintenance of the converted wetlands would consist of maintaining vegetation at the specified height, with periodic removal of vegetation exceeding specified height limits. Maintenance of the re-vegetated areas would consist of ongoing monitoring for and correction of erosion. Monitoring would document the success of the revegetation and replanting effort. If the monitoring program indicates that replanting or revegetation efforts have not been successful, then a contingency plan would be instituted to address replanting and/or revegetation of cleared areas, as necessary.

Funding sources for the preferred alternative, including the proposed mitigation activities, would be obtained from multiple sources. Funding sources could include Repair/Rehabilitation (if funded in phases); Cultural Resource Preservation Program; Line Item Construction (if funded all at the same time); and donations.

5. COMPLIANCE

CLEAN WATER ACT SECTION 404

The proposed actions have the potential for incidental impacts to waters of the United States as defined by the Clean Water Act and are therefore subject to review by the U.S. Army Corps of Engineers (USACE). The Clean Water Act Section 404 regulates the discharge of dredged or fill material into the waters of the United States. The preferred alternative does not require fill or dredging of any stream or wetland. Since this action would not result in fill material being placed in streams or wetlands and the proposed activity within the wetlands would not involve mechanized clearing, the preferred alternative would not require a USACE 404 Permit under the Clean Water Act. Coordination with USACE would occur during the EA review process.

Erosion and Sedimentation Control Plans would be completed to determine suitable landings or areas on the ground where trees would be temporarily stored while awaiting removal from the site. Suitable landings would be determined by soil type and natural hydrology of the project area. Stream crossings are not recommended. However in the event of a stream crossing metal/steel plates would be used to minimize the potential impacts to streams.

NATIONAL ENVIRONMENTAL POLICY ACT

This Statement of Findings for Executive Order 11990 will be included as a part of the EA for the proposed project. The EA will document compliance with the requirements of the National Environmental Policy Act for this project, as required under Director's Order 12, "Conservation Planning, Environmental Impact Analysis, and Decision-making."

6. CONCLUSION

Under the preferred alternative (Alternative C), there would be no net loss of wetlands; however, the overstory canopy within wetlands along streams would be reduced from 60-80 feet tall to 15 feet tall or less. Although the wetlands are not being filled and the wetland hydrology is not being altered, replacement of the wetland forest with a scrub-shrub canopy would diminish some functional values. Removal of the trees would reduce the opportunity for adding large woody debris to the stream channels, which is an important component of a healthy stream system. The loss of trees would eliminate canopy cover, nesting, and food sources used by some wildlife species. During the short-term transition period immediately after tree removal, the reduced canopy cover would likely increase soil and water temperatures, which may be harmful to fish, reptiles, amphibians, and other water dependent wildlife. During the short-term transition period there may be an increased potential for erosion of exposed soils.

The National Park Service finds that there are no practicable alternatives to altering approximately 7.01 acres of wetlands within the project area under Alternative C and that still meet park goals outlined in the EA. Potential impacts to wetlands from battlefield rehabilitation would involve clearing vegetation from 7.01 acres of forested wetland. Within a 50-foot buffer along streams (25 feet on each side), trees over 15 feet tall would be removed, while trees less than 15 feet tall would remain. This 50-foot streambank buffer would be replanted with native species as necessary to maintain woody vegetation along the streambanks. Vegetation in this area would be maintained at a maximum height of 15 feet using commercial pruning and trimming equipment. Outside of the 50-foot streambank buffer, wetland areas would be replanted with low-growing native grasses. Native woody vegetation would be allowed to naturally repopulate this area but maintained to a maximum height of 15 feet. Compensatory mitigation for proposed impacts from the preferred alternative (Alternative C) is described in Section 4.

Care was taken to select an alternative that would minimize the impacts on natural resources, including wetlands, while still meeting project objectives. Wetland impacts would be avoided to the maximum practicable extent, and the wetland impacts that cannot be avoided would be minimized. Compensatory mitigation ratio for this project (for improvement over loss, i.e., the trade of functional loss for functional improvement from wetland restoration and exotic vegetation removal) is greater than a 1:1 ratio. This project is consistent with the NPS no net loss of wetlands policy. The National Park Service, therefore, finds that this project is in compliance with Executive Order 11990: “Protection of Wetlands.”

7. REFERENCES

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APPENDIX A

VICKSBURG NATIONAL MILITARY PARK WETLAND DELINEATION

Vicksburg National Military Park

Wetland Delineation

Katya Kovalenko and Eric Dibble

Department of Wildlife and Fisheries
Mississippi State University

Final Report

December 2007

Executive Summary

This study was conducted to investigate potential wetlands in Vicksburg National Military Park. On-site determination was done according to the 1987 U.S. Corps of Engineers Manual and the decision about the status of each area was made following the U.S. Fish and Wildlife Service guidelines. This report describes the most common hydrophytic plant communities and discusses soil and hydrology indicators observed in the area. Wetlands were classified according to the National Wetlands Inventory as well as Hydrogeomorphic classification systems. Park wetlands were found to be either riverine, both unconsolidated bottom or streambed, or palustine forested wetlands. Wetlands in the park are most commonly associated with slopes with seepage-saturated soils, gullies, ephemeral creek beds, and streams. Attached map shows wetland boundaries to the best resolution of available digital elevation models. Qualitative assessments and analysis of available literature indicate that VNMP wetlands have several relatively high biological and hydrological functions.

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Introduction and definitions

Wetland is a generic term used to describe a variety of habitats including, but not limited to, marshes, swamps, bogs, and bottomland hardwood forests. According to the U.S. Fish and Wildlife Service, wetlands are "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year" (Cowardin *et al.* 1979). Alternatively, according to the 1987 U.S. Corps of Engineers Manual (thereafter, the 1987 manual), all three criteria (hydrology, soils and vegetation) must be met for an area to be designated a wetland. National Park Service adopts the U.S. Fish and Wildlife Service wetland classification system.

Vicksburg National Military Park (VNMP) commemorates the siege and defense of Vicksburg and, in addition to important cultural resources, the park also has a rich variety of natural habitats. This goal of this project was to investigate potential wetlands in Vicksburg National Military Park and their possible functions.

Methods

Existing maps

Off-site wetland determination often relies on Soil Survey, NWI, USGS or aerial photography. All available maps and an infrared aerial photo were reviewed for preliminary assessment of wetlands. Soil Survey maps for Warren County were used for preliminary

assessment of soils. Since forested wetlands are difficult to interpret based on aerial photography and none of the maps reviewed provided sufficient detail for off-site determination, an on-site routine method for large area (Environmental Laboratory 1987) was used for delineating VNMP wetlands.

Transect choice

Transects were chosen to intersect the main features of the terrain for example, perpendicular to a stream or across a gully. When topography allowed, intervals between transects were less then or equal to 0.5 mile. In certain cases, more transects were done to account for highly heterogeneous terrain. Yet in other cases sampling was impossible due to steep slopes. Overall boundary determination was done by extrapolating sampling points by the elevational gradients. According to the 1987 Manual, a representative sampling point was selected within each distinct plant community in a transect.

All sampling points were mapped using a Garmin ® GPSmap 76, except for several areas that had no satellite reception due to dense vegetation and narrow gullies; these were mapped based on landmarks such as distance from stream. Transects were done in accordance with the 1987 manual but each datasheet also contains information on whether the site is a wetland according to Fish and Wildlife Service National Wetland Inventory criteria (Cowardin *et al.* 1979), as mandated by the Procedural Manual 77-1 (National Park Service). Field work was conducted in February (preliminary), March, April, July, October, and November 2007. No sampling was done in July because of high precipitation which had a potential to bias hydrology criteria.

Vegetation

Woody vegetation, shrubs, and vines are usually sampled in 10-m radius plots (Environmental Laboratory 1987); however, due to a very complex landscape in the park, it was often impossible to find large enough terraces and distinct plant communities were observed at different elevations, so 5-m radius plots were chosen instead. Groundcover, *i.e.*, all non-woody plants and woody plants less than 1 m tall, were assessed in a $1m^2$ representative plot. An exception was made for *Arudinaria gigantea* taller than 1.5-2 m: it clearly belonged to the next stratum and directly competed with shrubs, not groundcover, therefore it was placed in shrubs category. Abundance of shrubs, vines, and herbs was quantified as either density, if plants of similar size occupied the stratum, or actual areal cover. Relative abundance of woody vegetation was quantified by circumference at breast height (Fig. A-1, Appendix 1). Dominance was assessed using the 1987 manual 50/20 rule. Wetland indicator status was determined using the USDA Plants database for Region 2.

Numerical value was assigned to each plant indicator status (1 for OBL to 11 for UPL) and weighted averages method was employed to calculate overall dominance. Hygrophyte dominance was calculated separately for each stratum but the overall plant density in the stratum was noted as well (*i.e.*, very sparsely populated herb stratum is negligible in biomass compared to the tree stratum). Additionally, an existing list of vegetation occurring in the park (Walker 1997) was analyzed for the presence of hydrophytes.

Hydrology

Visual observation of primary (inundation, drift lines, sediment deposits, drainage patters) and secondary (oxidized root channels and water-stained leaves) indicators was

conducted on each site. Soil saturation was determined as described in Richards Chinn's manual (2006). Duration of inundation or saturation had to be at least 5% of the growing season. Growing season is defined as the portion of the year when soil temperature is above biological zero (5 C). In Vicksburg, Mississippi, the growing season is approximately 250 days long, and soil saturation has to be observed for at least 13 continuous days during the period from March to November.

Soil

Soil was sampled using soil auger and probe to the depth of 12 inches (Fig. A-2, Appendix 1). Soil texture was described using field determination methods from Richards Chinn's manual (2006). Munsell® Soil Color Chart was used to determine soil color. Soil redox potential was assessed either using 0.2% α, α'-dipyridyl solution buffered with 1N ammonium acetate for detecting ferrous iron or indirectly by the presence of hydrogen sulfide smell, indicative of highly reduced conditions (≤-150mV). Hydric indicators were described according to the 1987 Manual as well as National Hydric Soil Indicators (Hurt *et al.* 1998). Ephemeral creek beds do not automatically warrant wetland status since they may not hold water for sufficient time to develop anaerobic conditions, so they were surveyed along with their adjacent areas to determine whether duration criteria were satisfied.

Results and Discussion

Wetland Indicators

Vegetation

In general, gullies, slopes, and stream banks of the park are dominated by hydrophytic vegetation (from FAC to FACW+, see Table 2 for indicator explanation). Analysis of separate strata shows that woody vegetation is often more hydrophytic than its understory. This is likely to be related to deeper wetland hydrology and/or seasonal soil saturation.

Many hydrophytic plant communities include boxelder (*Acer negundo*), sycamore (*Platanus occidentalis*), sugarberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), and, less frequently, willow oak (*Quercus phellos*), swamp chestnut oak (*Q. michauxii*), water oak (*Q. nigra*), and American hornbeam (*Carpinus caroliniana*) as canopy-forming vegetation with giant cane (*Arundinaria gigantea*) and scouringrush horsetail (*Equisetum hyemale*) in the understory (Figs. 1 and 2). Understory vegetation was often dominated by invasive plants, which complicated determination of its wetland status. For example, English ivy (*Hedera helix*) is a non-hydrophyte but was nevertheless observed in mesic areas of the park, displacing hydrophytic vegetation (Fig. 3). A list of commonly occurring plants and their indicator status is presented in Table 1.

A very similar palustrine forested wetland plant community was observed in East Texas by Tiner (1999). This community was dominated by boxelder, *Acer negundo*; water oak, *Quercos nigra*; sugarberry, *Celtis laevita*; and hornbeam, *Carpinus caroliniana* and included the following associated vegetation: sycamore, *Platanus occidentalis*; giant cane, *Arudinaria gigantea*; elder, *Sambucus candensis*, *Galium* sp., *Viola* sp., etc. This plant community was classified as mixed hardwood swamp.

Fig. 1. Scouring rush-boxelder riverine wetland community

Fig. 2. Giant cane-sycamore riverine wetland community

Fig. 3. Riverine wetland overgrown by English ivy.

Hydrology

Several primary wetland hydrology indicators were observed in the park. Most commonly, soil was saturated in the upper 12 inches, often months after the last rain. Loamy soils are well-drained and this saturation most likely indicates continuous seepage along the gravitational gradient. Stream-adjacent sites had water marks in the form of moss lines on tree trunks and, infrequently, buttressing. Drift lines, drainage patterns, and sediment deposits were observed in some cases; however, these features, independent of the duration of flooding, were assessed conservatively. Only non-vegetated flats (stream beds) and the area between the railroad tracks and the Yazoo canal experienced prolonged inundation (Fig. 4).

The most common secondary indicators were oxidized root channels and positive FAC-neutral test (indicating dominance of hydrophytes disregarding facultative vegetation). Some sites also had water-stained leaves, especially in ephemeral creek beds. The actual seepage wetlands have insufficient duration of inundation to display this feature, while duration of saturation is sufficient to display other indicators and be qualified as a wetland. Cautious interpretation of hydrology indicators is needed because of the unusual drought in the summer and fall of 2007 (USGS Drought Watch).

Fig. 4. Inundation of lower Mint Springs wetland by Yazoo flooding.

Soils

According to the Soil Survey maps, most of the park is described as Gullied land, which is not practical to classify as soil. These are young, recently deposited, and undifferentiated soils but may also include exposed bedrock. Soils from the less eroded parts of the park belong to Adler (Ad) and Memphis (MnD3, MeC3) series and are mostly silt loam by texture. Soil in the National Cemetery is classified by the Soil Survey Series as Silty land

(SsF), similar in material to Memphis silt loam but greatly modified. This area (the National Cemetery) was not sampled due to the expected lack of indicators in the modified soil and historical significance of the site.

On-site determination confirmed weak profile development in most areas of the park. Therefore, soil was not classified and three of the 1987 manual Hydric Soil indicators were not applicable: Aquic Moisture Regime; Listed on Local Hydric Soils and National Hydric Soils List. In the absence of profile development, the overall color pattern, mottles, and other properties were described. It was not possible to use the dipyridyl indicator, possibly due to the presence of unidentified interfering compounds or low iron content.

The most common soil textures were sandy loam and loamy sand except for the lower part of Mint Springs, which had sandy clay loam. Predominant soil colors were brown and yellowish brown (10YR 4/3 and 4/4, Munsell® Soil Color Chart) but other colors were observed as well. The 1987 Corps manual lists sandy and recently deposited soils as potential problem areas for determination as they may not posses any typical hydric soil properties. Not surprisingly, hydric soil indicators were observed less frequently than vegetation and hydrology indicators. Stream bank and ephemeral creek soils sometimes had hydrogen sulfide, indicative of very reduced, anaerobic conditions. These soils often had gleyed matrix (*e.g.*, site 30 at the South Loop, see Appendix 2, Table A.1 for data forms) or prominent gleyed inclusions (*e.g.*, site 101 at Thayer's approach).

Soil samples from many areas contained organic remains such as partially decomposed leaves, roots and unidentifiable plant tissues throughout the upper 12 in. High organic content was observed in the surface layer of some soil samples; however, this layer was never thicker than 2-3 cm. Most common distinction between hydric and nearby non-

hydric soils was the presence of redox depletions (gray colors), redox concentrations (red colors), and stratified soil with differently colored layers some of which appeared leached (light yellow with chroma 2 or less, or gley). This type of soil was frequently observed on slopes and in the gullies and areas adjacent to the streams or ephemeral creek beds.

Classification and mapping

Park wetlands belong to one of the following Cowardin *et al.* (1979) categories: 1. streams are Riverine, Upper perennial, Unconsolidated bottom (Fig. 5); 2. creeks are Riverine, Intermittent, Streambed; and 3. forested wetlands are Palustirne, Forested Wetlands. The following modifiers apply: all wetlands are non-tidal, seasonally flooded/saturated; inland fresh, circumneutral; on mineral soil. Some slope wetlands (see below) also had wetlands belonging to the Moss/Lichen class (Fig. 6); these are too small to be mapped separately but are nevertheless important for habitat heterogeneity. According to Brinson's Hydrogeomorphic Classification (HGM, 1993), VNMP wetlands belong to either riverine or slope (Fig. 7) hydrogeomorphic class.

Functionally, forested wetlands are seepage or slope wetlands, which are recharged from rainwater that percolates from higher elevations and contributes to seepage, subsurface, and sheet flows. While geology of the area was not studied, it is hypothesized that seepage occurs due to longitudinal orientation of deep strata and/or presence of impermeable strata (e.g, Stein et al., Tiner, 1999). Recharge depends on regional factors such as precipitation and local factors such as slope. A thorough understanding of the recharge mechanism is necessary for assessing potential impact of management actions on wetlands and adjacent non-wetland areas. According to disturbance level criteria (Cole *et al.* 1997), most seepage and riverine

wetlands in the park were judged pristine to moderately disturbed (primarily by up-stream modifications and invasive plants), except for modified wetlands that appeared severely disturbed.

Wetlands were mapped in ArcMap® (ESRI) to the best resolution available for current digital elevation models (MARIS). Ephemeral creek wetlands and unconsolidated bottom riverine wetlands were not mapped separately because at the available resolution they would appear as line features (due to their small size). HGM slope and riverine wetlands are mapped together because they are not hydrologically distinct (Fig. A-3, Appendix 2). For forested wetlands, topography may be more useful for making on-site management decisions than a map, because the latter may not show enough detail on this very complex and dissected landscape. Seepage wetlands are very patchy by nature but, as a useful approximation for ecosystem-oriented management, most slopes with seepage-saturated soils, gullies, ephemeral creek beds, and streams are to be considered wetlands.

Fig. 5. An example of Riverine, Upper Perennial, Unconsolidated Bottom wetland.

Fig. 6. An example of Moss-Lichen seepage wetland (Note that *Pteris multifida* is an exotic species and is not a wetland indicator).

Fig. 7. An example of Palustrine, Forested seepage wetland (on slopes only).

Wetland functions

Wetland functions are commonly assessed using hydrologic, biogeochemical, and biologic function criteria. Hydrologic functions of slope wetland commonly include ground and surface water interception and water retention and groundwater export. Water interception is a fundamental property of slope wetlands (Stein *et al.* 2004). Removal of vegetation outside of park boundaries as well as in some areas of the park may have led to increased siltation in nearby streams (Dibble, 2003). Therefore, forested wetlands of the park may play an important role in control of erosion and siltation. Dense growth of Chinese privet may compromise this and habitat wetland functions: observations indicate very sparse herb and other shrub cover and lack of extensive root system in gullies overgrown with privet, whereas nearby areas dominated by giant cane (*Arundinaria gigantea*) had a more extensive root system in the upper part of the soil (Fig. 2).

Water retention by seepage wetlands is essential for stream flow maintenance and integrity of the overall watershed. Study of slope wetlands in another part of the country has shown that ground-water levels remained near the surface for two to eight months, depending on the type of geologic setting (Stein *et al.* 2004). In this study, saturated soils were observed two months after the last significant precipitation. It is also possible that seepage wetlands prevent the soil from extreme desiccation, which may lead to changes in soil structure; therefore, this type of wetland is important for maintaining soil integrity and reducing erosion. Drier soil was observed in several areas of the park recently cleared of vegetation and reduced flows were observed in intermittent streams adjacent to cleared areas.

Biogeochemical functions of wetlands include organic carbon accumulation and export, retention and release of compounds, and nutrient cycling. These functions were not

assessed for park wetlands and their degree of importance cannot be extrapolated from the available data. Regional contribution of this type of function (downstream contribution to a major watershed) is likely to be correlated with watershed input contribution of park's streams.

Biological functions of wetlands consist of maintenance of plant and animal communities and regional and landscape biodiversity. Several obligatory wetland plants were observed in VNMP during floristic assessment (Walker 1997): water pennywort, *Hydrocotyle verticillata*; great blue lobelia, *Lobelia siphilitica*; redroot flatsedge, *Cyperus erythrorhizos*; smartweed, *Polygonum hydropiperoides*; water pimpernel, *Samolus floribundus*, etc. Presence of these species increases regional biodiversity because they would not be in the area if not for adequate hydrology and saturated soil conditions.

Park wetlands have relatively high habitat function: most seepage wetlands support diverse and locally unique plant communities. Several disturbance-sensitive plants, observed during implementation of this project, indicate high-quality habitat (*e.g.*, green dragon, *Arisaema dracontium*; American ginseng, *Panax quinquefolius*; Jack-in-the-pulpit, *Arisaema triphyllum*). Vicksburg NMP contains one of the few remaining tracts of loess bluff hardwood forests on public land in the United States (EAS 2004); therefore, these wetlands support plant communities that are regionally rare. Slope wetlands from other parts of the country have been shown to have relatively high plant and wildlife habitat function, disproportionate to their small area (*reviewed in* Stein *et al.* 2004). Some areas had lower habitat quality due to the presence of invasive species, especially English ivy and Chinese privet.

Some classification systems also include educational function – this function level is potentially high, since the area contains many trails intersecting high quality, regionally unique habitats, and also by virtue of it being a National Park. It is also interesting that several different types of wetlands occur within a park.

Impacted wetlands

Most common modification was clear-cutting of vegetation. These areas were assessed using only the soil criterion, in accordance with the 1987 manual treatment of *Problem Areas*. Several sites had modification in the form of drainage culverts; however, these sites were characterized as having *Normal Circumstances* since canopy-forming vegetation was present and appeared undisturbed.

Former/relict wetlands

Several modified areas were expected to have wetland soils but did not (e.g., sites 96-99). Possible reasons include very thick recent deposition due to extreme erosional events (upper 12 inches represented last few years instead of decades) in which wetland characteristics did not have time to develop, and in some areas also due to drying of the soil after vegetation removal. It is therefore impossible to determine whether those areas were formerly a wetland.

Potential for restoration

Based on qualitative observation of modified areas, hydrology and even soils appear altered after clearing; therefore, the potential for restoration is low. Seepage wetlands in

general are very difficult to restore due to their complex hydrodynamics. Riverine wetlands may have a greater restoration potential if the upstream flow is not altered; however, a detailed analysis of recharge mechanisms is necessary to make predictions of management impacts.

On the contrary, unmodified wetlands (satisfying Normal Circumstances criterion, which in this case means that natural vegetation is present), have a relatively high potential for restoration: habitat functions can be improved by control of invasive plants.

Acknowledgements

We would like to express our gratitude to the Gulf Coast Cooperative Ecological Studies Unit, National Park Service, and Vicksburg National Military Park for support during this study, especially Kurt Foote, now with the Natchez Trace Parkway, for initiating this project. Many thanks to Virginia DuBowy from VNMP for logistical support, Chris Doffitt for help with difficult plant identification, Janet Dewey for soil sampling equipment, and Dr. Richard Minnis, Matt Palumbo, Wilfredo Robles, and Rafael Gonzalez for advice on ArcMap. Finally, we would like to thank Sergey Ilyushkin for his dedicated help in the field.

Table 1. Plants encountered in transects and their wetland status.

Common name	Latin name	Stratum	Status
American beech	*Fagus grandifolia*	4-trees	FACU
American ginseng	*Panax quinquefolius*	1- herbs	UPL
American holly	*Ilex opaca*	2-shrubs	FAC-
American hornbeam	*Carpinus caroliniana*	4-trees	FAC
Asian netvein hollyfern	*Cyrtomium fortunei*	1- herbs	NI
birdeye speedwheel	*Veronica persica*	1- herbs	NI
bitternut hickory	*Carya cordiformis*	4-trees	FAC
black cherry	*Prunus serotina*	2-shrubs	FACU
blackberry	*Rubus argutus*	2-shrubs	FACU+
boxelder	*Acer negundo*	4-trees	FACW
Chinaberrytree	*Melia azedarach*	2-shrubs	NI
Christmas fern	*Polystichum acrostichoides*	1- herbs	FAC
cinnamon fern	*Osmunda cinnamomea*	1- herbs	FACW+
common ladyfern	*Athyrium filix-femina*	1- herbs	FAC
common persimon	*Diospyros virginiana*	2-shrubs	FAC
cutleaf geranium	*Geranium dissectum*	1- herbs	NI
eastern cottonwood	*Populus deltoides*	4-trees	FAC+
eastern hayscented fern	*Dennstaedtia punctilobula*	1- herbs	UPL
eastern redbud	*Cercis canadensis*	2-shrubs	FACU
eastern redcedar	*Juniperus virginiana*	4-trees	FACU-
English ivy	*Hedera helix*	3-vines	NI
flowering dogwood	*Cornus florida*	2-shrubs	FACU
giant cane	*Arundinaria gigantea*	2-shrubs	FACW
green dragon	*Arisaema dracontium*	1- herbs	FACW
hardy orange	*Poncirus trifoliata*	2-shrubs	UPL
hobblebush	*Viburnum lantanoides*	2-shrubs	FAC
Japanese honeysuckle	*Lonicera japonica*	2-shrubs	FAC-
jumpseed	*Polygonum virginianum*	1- herbs	FAC
ladyfern	*Athyrium filix-femina*	1- herbs	FAC
muscadine	*Vitis rotundifolia*	3-vines	FAC
Nepalese browntop	*Microstegium vimineum*	1- herbs	FAC+
northern maidenhair	*Adiantum pedatum*	1- herbs	FACU
oakleaf hydrangea	*Hydrangea quercifolia*	2-shrubs	UPL
pecan	*Carya illinoinensis*	4-trees	FAC+
poison ivy	*Toxicodendron radicans*	3-vines	FAC
privet, chinese	*Ligustrum sinense*	1- herbs	FAC
red maple	*Acer rubrum*	2-shrubs	FAC

red mulberry	*Morus rubra*	2-shrubs	FAC
sand violet	*Viola affinis*	1- herbs	FACW
saw greenbrier	*Smilax bona-nox*	3-vines	FAC
scouringrush horsetail	*Equisetum hyemale*	1- herbs	FAC+
sedge, narrowleaf	*Carex amphibola*	1- herbs	FACW
silky dogwood	*Cornus amomum*	2-shrubs	FACW+
slippery elm	*Ulmus rubra*	4-trees	FAC
southern magnolia	*Magnolia grandiflora*	4-trees	FAC+
sugarberry	*Celtis laevigata*	4-trees	FACW
swamp chestnut oak	*Quercus michauxii*	4-trees	FACW-
sweetgum	*Liquidambar styraciflua*	4-trees	FAC+
sycamore	*Platanus occidentalis*	4-trees	FACW-
tulip tree	*Liriodendron tulipifera*	4-trees	FAC
Virginia creeper	*Parthenocissus quinquefolia*	3-vines	FAC
Virginia creeper	*Parthenocissus quinquefolia*	3-vines	FAC
water oak	*Quercus nigra*	4-trees	FAC
wild hydrangea	*Hydrangea arborescens*	2-shrubs	FACU
wild hydrangea	*Hydrangea arborescens L.*	2-shrubs	FACU
willow oak	*Quercus phellos*	4-trees	FACW-
willow, peachleaf	*Salix amygdaloides*	4-trees	FACW
wisteria	*Wisteria frutescens*	3-vines	FACW

Table 2. Explanation of wetland indicator status (*Source*: Reed 1988; USDA Plants).

Indicator Category	Probability of occurrence in wetlands	Status
Obligate wetland (OBL)	>99% of the time	Hydrophyte
Facultative wetland (FACW)	67-99%	Hydrophyte
Facultative (FAC)	34-66%	FAC, FAC+ Hydrophyte FAC- Non-hydrophyte
Facultative upland (FACU)	1-33%	Non-hydrophyte
Upland (UPL)	<1%	Non-hydrophyte
No Indicator (NI)	-	Not enough information

Table 3. Potential value of VNMP wetlands in terms of some of the common wetland functions

Wetland Function	**Level**	**Notes**
Removing sediment	Med	Indirect, by flow attenuation
Removing nutrients/phosphorus	No data	Likely short residence time
Removing nutrients/nitrogen	No data	See above
Removing metals and toxic organic compounds	No data	
Reducing downstream erosion and flooding	High	Flow attenuation
Recharging groundwater and streams	Local: High Regional: Minor	Important for stream flow maintenance, integrity of the watershed
General habitat	High	Locally unique and regionally rare habitats
Habitat for invertebrates	No data	
Habitat for amphibians	High	At least 5 species of salamanders and 12 species of Anurans (Keiser 2002)
Habitat for birds	Med/High	Neotropical migrant use
Habitat for aquatic mammals	Med	Riverine wetlands only
Richness of native plants	High	
Supporting food webs	No data	
Educational	High	Trails, uncommon plant communities

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Appendix 1

Fig. A-1. Measuring tree circumference for dominance assessment.

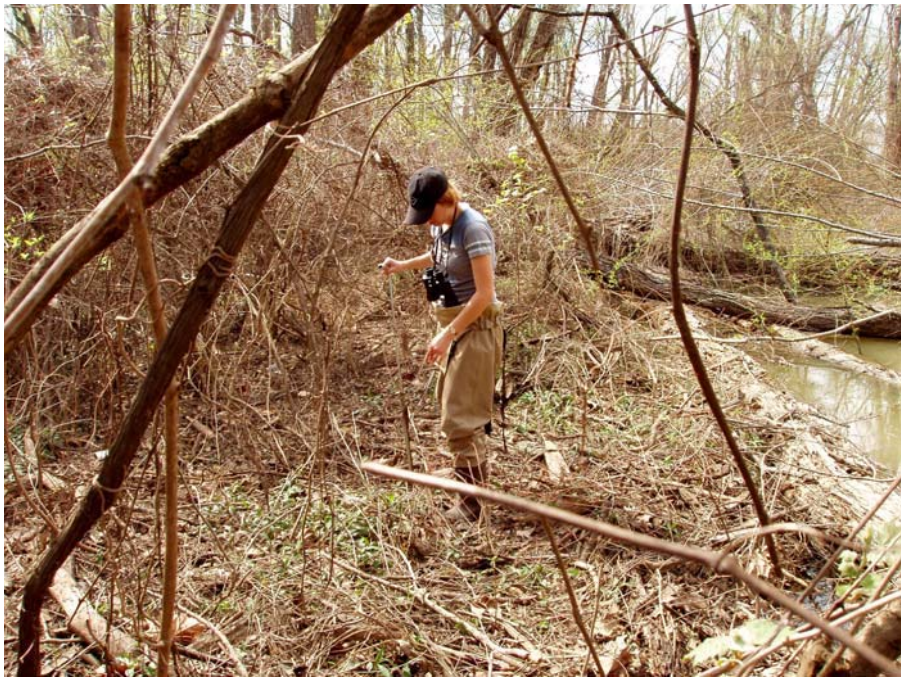


Fig. A-2. Sampling soil with a probe in a flooded riverine wetland.

Appendix 2

Fig. A-3. Map of the park with sampling locations and wetland boundaries.

Fig. A-4. Digital elevation model for Warren county (MARIS) with park boundaries.

Table A.1. Data forms.

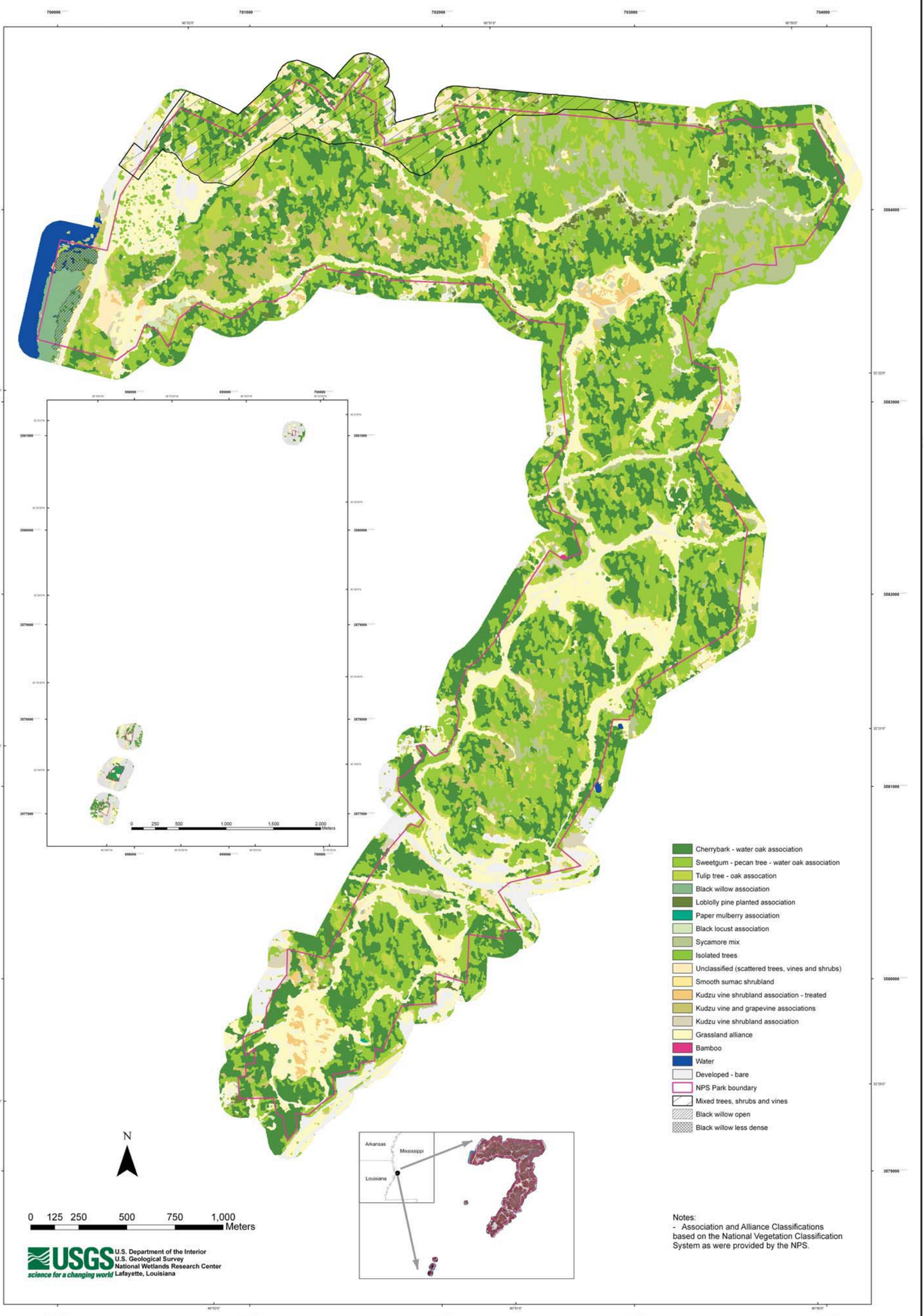
APPENDIX E

USGS LANDCOVER CLASSIFICATION

Vicksburg National Military Park
Mississippi

National Park Service
U.S. Department of the Interior

Landcover Classification



Notes:
- Association and Alliance Classifications based on the National Vegetation Classification System as were provided by the NPS.

USGS U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
science for a changing world Lafayette, Louisiana

October 2007

APPENDIX F

VICKSBURG NATIONAL MILITARY PARK WILDLIFE AND HABITAT

Appendix F: Vicksburg National Military Park Wildlife and Habitat

Vicksburg National Military Park Environmental Assessment for Landscape Rehabilitation

Common Name (Technical Name)	Streams and Riparian Zones	Forested Wetlands	Cleared/ Herbaceous Wetlands	Forested Uplands	Cleared/ Herbaceous Uplands	[1] Edge or Generalist Habitat	[2] Locally Migrant	[3] Long-distance Migrant
Fish								
Fathead minnow (*Pimephales promelas*)	X						N	N
Amphibians								
American toad (*Bufo americanus*)		X		X			Y	N
Bull frog (*Rana catesbeiana*)	X	X					Y	N
Cope's gray treefrog (*Hyla chrysoscelis*)		X	X	X			Y	N
Eastern narrowmouth toad (*Gastrophryne carolinensis*)		X	X				Y	N
Eastern spadefoot (*Scaphiopus holbrookii*)	X			X			Y	N
Florida leopard frog (*Rana sphenocephala*)	X	X	X				Y	N
Fowler's toad (*Bufo fowleri*)		X		X			Y	N
Gray treefrog (*Hyla versicolor*)		X	X	X			Y	N
Gray treefrog complex (*Hyla* sp.)		X	X				Y	N
Green frog (*Rana clamitans*)	X	X	X				Y	N
Green treefrog (*Hyla cinerea*)	X	X	X				N	N
Longtail salamander (*Eurycea longicauda*)	X	X					N	N
Mississippi slimy salamander (*Plethodon mississippi*)	X	X					N	N
Mole salamander (*Ambystoma talpoideum*)		X		X			Y	N
Northern cricket frog (*Acris crepitans*)	X		X				N	N
Spotted dusky salamander (*Desmognathus fuscus*)	X	X					N	N
Spotted salamander (*Ambystoma maculatum*)		X					Y	N
Spring peeper (*Pseudacris crucifer*)		X		X			Y	N
Three-lined salamander (*Eurycea longicauda guttolineata*)	X	X					N	N
Reptiles								
Alligator snapping turtle (*Macroclemys temminckii*)	X		X				Y	N
Broadhead skink (*Eumeces laticeps*)		X		X			Y	N
Common garter snake (*Thamnophis sirtalis*)	X	X					Y	N
Common king snake (*Lampropeltis getula*)		X	X				N	N
Common musk turtle (*Sternotherus odoratus*)	X	X					N	N
Copperhead (*Agkistrodon contortrix*)				X			Y	N
Corn snake (*Elaphe guttata*)				X	X		N	N
Cottonmouth (*Agkistrodon piscivorus*)	X				X		Y	N
Eastern box turtle (*Terrapene carolina*)		X		X			N	N
Eastern racer (*Coluber constrictor*)					X		Y	N
Eastern ratsnake (*Elaphe obsoleta*)		X			X		Y	N
Eastern river cooter (*Pseudemys concinna*)	X	X					N	N
Eastern worm snake (*Carphophis amoenus*)				X			N	N
False map turtle (*Graptemys pseudogeographica*)	X						N	N

Appendix F: Vicksburg National Military Park Wildlife and Habitat

Vicksburg National Military Park Environmental Assessment for Landscape Rehabilitation

Common Name (Technical Name)	Streams and Riparian Zones	Forested Wetlands	Cleared/ Herbaceous Wetlands	Forested Uplands	Cleared/ Herbaceous Uplands	[1] Edge or Generalist Habitat	[2] Locally Migrant	[3] Long-distance Migrant
Five-lined skink (*Eumeces fasciatus*)	X			X			N	N
Green anole (*Anolis carolinensis*)		X		X			N	N
Ground skink (*Scincella lateralis*)	X			X			N	N
Mississippi map turtle (*Graptemys pseudogeographica*)	X	X	X				N	N
Northern water snake (*Neropia sipedon*)		X	X				N	N
Ouachita map turtle (*Graptemys ouachitensis*)	X						N	N
Painted turtle, southern (*Chrysemys dorsalis*)	X	X					N	N
Painted turtle, northern (*Chrysemys picta*)	X	X	X				Y	N
Plainbellied water snake (*Nerodia erythrogaster*)	X	X	X				N	N
Red-bellied snake (*Storeria occipitomaculata*)	X			X			Y	N
Ringneck snake (*Diadophis punctatus*)				X	X		Y	N
Rough green snake (*Opheodrys aestivus*)		X		X			N	N
Slider (*Trachemys scripta*)	X	X					N	N
Snapping turtle (*Chelydra serpentinA*)	X	X	X				Y	N
Timber rattlesnake (*Crotalus horridus*)		X	X	X	X		Y	N
Birds								
Acadian flycatcher (*Empidonax virescens*)		X		X			N	Y
American goldfinch (*Carduelis tristis*)	X	X	X	X	X	X	Y	Y
American crow (*Corvus brachyrhynchos*)	X	X	X	X	X	X	Y	Y
American redstart (*Setophaga ruticilla*)	X	X		X			N	Y
American robin (*Turdus migratorius*)	X	X	X	X	X	X	Y	Y
Bald eagle (*Haliaeetus leucocephalus*)	X	X		X			Y	Y
Baltimore oriole (*Icterus galbula*)	X	X	X	X	X	X	Y	Y
Barn swallow (*Hirundo rustica*)	X		X		X		N	Y
Barred owl (*Strix varia*)	X	X	X	X			Y	N
Belted Kingfisher (*Ceryle alcyon*)	X	X	X				Y	Y
Black vulture (*Coragyps atratus*)				X	X		Y	N
Black-and-white warbler (*Mniotilta varia*)	X	X		X			N	Y
Black-throated green warbler (*Dendroica virens*)	X	X	X	X	X	X	N	Y
Blackburnian warbler (*Dendroica fusca*)				X			N	Y
Blue jay (*Cyanocitta cristata*)	X	X	X	X	X	X	Y	Y
Blue grosbeak (*Passerina caerulea*)	X	X	X	X	X	X	Y	Y
Blue-gray gnatcatcher (*Polioptila caerulea*)	X	X	X	X	X	X	Y	Y
Blue-winged warbler (*Vermivora pinus*)	X	X	X	X	X	X	N	Y
Bobolink (*Dolichonyx oryzivorus*)			X		X		N	Y
Broad-winged hawk (*Buteo platypterus*)	X	X	X	X	X	X	N	Y
Brown thrasher (*Toxostoma rufum*)	X			X	X	X	Y	Y

Appendix F: Vicksburg National Military Park Wildlife and Habitat

Vicksburg National Military Park Environmental Assessment for Landscape Rehabilitation

Common Name (Technical Name)	Streams and Riparian Zones	Forested Wetlands	Cleared/ Herbaceous Wetlands	Forested Uplands	Cleared/ Herbaceous Uplands	[1] Edge or Generalist Habitat	[2] Locally Migrant	[3] Long-distance Migrant
Brown-headed cowbird (*Molothrus ater*)	X	X	X	X	X	X	Y	Y
Canada goose (*Branta canadensis*)	X		X		X		Y	Y
Carolina chickadee (*Poecile carolinensis*)	X	X	X	X	X	X	N	N
Carolina wren (*Thryothorus ludovicianus*)	X	X	X	X	X	X	N	N
Cardinal (*Cardinalis cardinalis*)	X	X	X	X	X	X	N	N
Cattle egret (*Bubulcus ibis*)	X	X	X				Y	Y
Cedar waxwing (*Bombycilla cedrorum*)	X			X	X	X	Y	Y
Chimney swift (*Chaetura pelagica*)				X			N	Y
Chipping sparrow (*Spizella passerina*)	X			X	X	X	Y	Y
Common grackle (*Quiscalus quiscula*)	X	X	X	X	X	X	Y	Y
Common yellowthroat (*Geothlypis trichas*)	X	X	X				Y	Y
Double-crested cormorant (*Phalacrocorax auritus*)	X	X					Y	Y
Downy woodpecker (*Picoides pubescens*)	X	X	X	X	X	X	Y	N
Eastern bluebird (*Sialia sialis*)	X			X	X	X	Y	Y
Eastern kingbird (*Tyrannus tyrannus*)	X	X	X	X	X	X	N	Y
Eastern towhee (*Pipilo erythrophthalmus*)	X	X	X	X	X	X	Y	Y
Eastern wood-pewee (*Contopus virens*)	X			X	X	X	N	Y
Eurasian collared dove (*Streptopelia decaocto*)	X			X	X		N	N
European starling (*Sturnus vulgaris*)	X	X	X	X	X	X	Y	N
Fish crow (*Corvus ossifragus*)	X	X	X				Y	N
Gray catbird (*Dumetella carolinensis*)	X			X	X	X	Y	Y
Great blue heron (*Ardea herodias*)	X	X	X				Y	Y
Great crested flycatcher (*Myiarchus crinitus*)	X	X	X	X	X	X	N	Y
Great egret (*Ardea alba*)	X	X	X		X		Y	Y
Hairy woodpecker (*Picoides villosus*)	X	X		X			Y	N
Hermit thrush (*Catharus guttatus*)	X	X		X			Y	Y
Hooded warbler (*Wilsonia citrina*)	X	X		X			N	Y
House finch (*Carpodacus mexicanus*)	X			X	X	X	Y	Y
House sparrow (*Passer domesticus*)					X		N	N
Indigo bunting (*Passerina cyanea*)	X			X	X	X	N	Y
Kentucky warbler (*Oporornis formosus*)	X	X		X			N	Y
Kinglet (*Regulus calendulus* or *satrapa*)				X			Y	Y
Little blue heron (*Egretta caerulea*)	X	X	X				Y	Y
Loggerhead shrike (*Lanius ludovicianus*)					X		Y	Y
Mississippi kite (*Ictinia mississippiensis*)	X	X	X	X	X	X	N	Y
Mourning dove (*Zenaida macroura*)	X			X	X	X	Y	Y
Northern cardinal (*Cardinalis cardinalis*)	X	X	X	X	X	X	N	N

Common Name (Technical Name)	Streams and Riparian Zones	Forested Wetlands	Cleared/ Herbaceous Wetlands	Forested Uplands	Cleared/ Herbaceous Uplands	[1] Edge or Generalist Habitat	[2] Locally Migrant	[3] Long-distance Migrant
Northern flicker (*Colaptes auratus*)	X			X	X	X	Y	Y
Northern mockingbird (*Mimus polyglottos*)	X			X	X	X	N	N
Northern parula (*Parula americana*)	X	X		X			N	Y
Northern rough-winged swallow (*Stelgidopteryx serripennis*)	X		X		X		Y	Y
Orchard oriole (*Icterus spurius*)	X			X	X	X	N	Y
Pileated woodpecker (*Dryocopus pileatus*)	X			X			N	N
Pine warbler (*Dendroica pinus*)				X			Y	Y
Prairie warbler (*Dendroica discolor*)	X	X	X	X	X	X	Y	Y
Prothonotary warbler (*Prothonotaria citrea*)	X	X		X			N	Y
Purple martin (*Progne subis*)	X		X		X		N	Y
Red-bellied woodpecker (*Melanerpes carolinus*)	X	X		X			N	N
Red-eyed vireo (*Vireo olivaceus*)	X	X		X			N	Y
Red-headed woodpecker (*Melanerpes erythrocephalUs*)	X			X	X	X	Y	N
Red-shouldered hawk (*Buteo lineatus*)	X	X		X	X	X	Y	Y
Red-tailed hawk (*Buteo jamaicensis*)	X			X	X	X	Y	Y
Red-winged blackbird (*Agelaius phoeniceus*)	X	X	X				Y	Y
Rock pigeon (*Columba livia*)	X				X		N	N
Rose-breasted grosbeak (*Pheucticus ludovicianus*)	X	X		X	X	X	N	Y
Ruby-crowned kinglet (*Regulus calendula*)				X	X		Y	Y
Ruby-throated hummingbird (*Archilochus colubris*)	X	X	X	X	X	X	Y	Y
Sedge wren (*Cistothorus platensis*)	X		X		X		Y	Y
Sharp-shinned hawk (*Accipiter striatus*)	X			X			Y	Y
Summer tanager (*Piranga rubra*)	X			X	X	X	N	Y
Swainson's warbler (*Limnothlypis swainsonii*)	X	X		X			N	Y
Tennessee warbler (*Vermivora peregrina*)	X	X	X	X	X	X	N	Y
Turkey vulture (*Cathartes aura*)	X	X		X	X		Y	Y
Tufted titmouse (*Baeolophus bicolor*)	X			X	X	X	N	N
White-eyed vireo (*Vireo griseus*)	X			X	X		Y	Y
White-throated sparrow (*Zonotrichia albicollis*)	X		X	X	X	X	N	Y
Wild turkey (*Meleagris gallopavo*)				X	X	X	N	N
Wood duck (*Aix sponsa*)	X	X	X	X			Y	Y
Wood thrush (*Hylocichla mustelina*)	X	X		X			N	Y
Worm-eating warbler (*Helmitheros vermivorus*)	X			X			N	Y
Yellow-bellied sapsucker (*Sphyrapicus varius*)	X			X	X		Y	Y
Yellow-billed cuckoo (*Coccyzus americanus*)	X		X	X	X	X	N	Y
Yellow-breasted chat (*Icteria virens*)	X	X	X	X	X	X	N	Y
Yellow-rumped warbler (*Dendroica coronata*)		X		X			Y	Y

Common Name (Technical Name)	Streams and Riparian Zones	Forested Wetlands	Cleared/ Herbaceous Wetlands	Forested Uplands	Cleared/ Herbaceous Uplands	[1] Edge or Generalist Habitat	[2] Locally Migrant	[3] Long-distance Migrant
Yellow-throated vireo (*Vireo flavifrons*)	X	X	X	X	X	X	N	Y
Yellow-throated warbler (*Dendroica dominica*)	X	X		X			N	Y
Mammals								
Beaver (*Castor canadensis*)	X						N	N
Big brown bat (*Eptesicus fuscus*)	X			X			N	N
Bobcat (*Lynx rufus*)	X	X		X			N	N
Brazilian free-tailed bat (*Tadarida brasiliensis*)	X			X			Y	Y
Cotton mouse (*Peromyscus gossypinus*)	X	X		X			N	N
Coyote (*Canis latrans*)	X			X	X	X	N	N
Eastern chipmunk (*Tamias striatus*)				X	X		N	N
Eastern cottontail rabbit (*Sylvilagus floridanus*)	X	X	X	X	X	X	N	N
Eastern fox squirrel (Sciurus niger)	X			X	X	X	N	N
Eastern harvest mouse (*Reithrodontomys humulis*)			X		X		N	N
Eastern mole (*Scalopus aquaticus*)				X	X		N	N
Eastern pipistrelle (*Pipistrellus subflavus*)	X			X	X		Y	N
Eastern red bat (*Lasiurus borealis*)	X			X	X		N	N
Eastern woodrat (*Neotoma floridana*)	X	X		X			N	N
Evening bat (*Nycticeius humeralis*)	X			X	X		Y	Y
Gray fox (*Urocyon cinereoargenteus*)	X	X		X	X		N	N
Gray squirrel (*Sciurus carolinensis*)	X			X	X	X	N	N
Hispid cotton rat (*Sigmodon hispidus*)	X		X		X		N	N
Hoary Bat (*Lasiurus cinereus*)	X			X			N	Y
House mouse (*Mus musculus*)				X	X		N	N
Least shrew (*Cryptotis parva*)	X	X	X	X	X	X	N	N
Long-tailed weasel (*Mustela frenata*)	X	X	X	X	X	X	N	N
Nine-banded armadillo (*Dasypus novemcinctus*)	X			X	X		N	N
Nutria (*Myocastor coypus*)	X	X	X				N	N
Pine Vole (*Microtus pinetorum*)	X	X	X	X	X		N	N
Raccoon (*Procyon lotor*)	X	X		X		X	N	N
Red fox (*Vulpes fulvus*)	X			X	X	X	N	N
Seminole Bat (*Lasiurus seminolus*)	X	X		X	X		N	N
Southeastern shrew (*Sorex longirostris*)	X	X	X	X			N	N
Southern short-tailed shrew (*Blarina carolinensis*)	X			X	X		N	N
Southern flying squirrel (*Glaucomys volans*)	X			X			N	N
Spotted skunk (*Spilogale putorius*)	X			X	X	X	N	N
Striped skunk (*Mephitis mephitis*)	X	X	X	X	X	X	Y	N
Swamp rabbit (*Sylvilagus aquaticus*)	X	X	X				N	N

Appendix F: Vicksburg National Military Park Wildlife and Habitat

Vicksburg National Military Park Environmental Assessment for Landscape Rehabilitation

Common Name (Technical Name)	Streams and Riparian Zones	Forested Wetlands	Cleared/ Herbaceous Wetlands	Forested Uplands	Cleared/ Herbaceous Uplands	[1] Edge or Generalist Habitat	[2] Locally Migrant	[3] Long-distance Migrant
Virginia oppossum (*Didelphis virginiana*)	X	X	X	X	X	X	N	N
White-footed mouse (*Peromyscus leucopus*)	X			X	X	X	N	N
White-tailed deer (*Odocoileus virginianus*)	X	X		X	X	X	Y	N

Sources:

Keiser Edmund D. 2002. Survey of Amphibians and Reptiles of the Vicksburg National Military Park, Final Report. NPS Contract No. P5600010019.

Linehan, Jennifer M., and Michael T. Mengak. 2006. Inventory of the Mammalian Species at Vicksburg National Military Park, Final Report. Task Order #J2115 04 0012

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: April 20, 2009).

Somershoe, Scott G, Daniel J. Twedt, and Bruce Reid. 2004. Bird Density and Abundance at Vicksburg National Military Park.

[1] Edge species determinations from NatureServe (2009) and Wear, David N.; Greis, John G., eds. 2002. Southern forest resource assessment. Gen. Tech. Rep. SRS-53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station.

[2] Locally Migrant (Natureserve, 2009): Indicates this species makes local extended movements (generally less than 200 km) at particular times of the year (e.g., to breeding or wintering grounds, to hibernation sites).

[3] Long Distance Migrant (Natureserve, 2009): Indicates populations make annual migrations of over 200 km.

APPENDIX G

IMPACT TOPIC THRESHOLD DEFINITIONS

APPENDIX G

IMPACT TOPIC THRESHOLD DEFINITIONS

The terms of potential impacts are described as follows:

- Type – Are the impacts beneficial or adverse?
- Context – Are the impacts site-specific, local, or regional?
- Duration – Are the impacts short-term, lasting less than one year, or long-term, lasting more than one year?
- Intensity – Are the impacts negligible, minor, moderate, or major?

Specific impact definitions apply to each of the impact topics addressed in this EA. The definitions are defined in terms of intensity (negligible, minor, moderate, and major) and duration (short-term and long-term).

Recreational Resources, Aesthetics, and Visitor Experience

Negligible: Visitors would not be impacted, or changes in visitor use and/or experience would be below or at the level of detection. Any impacts would be short-term. The visitor would not likely be aware of the impacts associated with the alternative.

Minor: Adverse and beneficial changes in visitor use and/or experience would be detectable, although the changes would be slight. The visitor would be aware of the impacts associated with the alternative, but the impacts would be slight.

Moderate: Adverse and beneficial changes in visitor use and/or experience would be readily apparent. The visitor would be aware of the impacts associated with the alternative and would likely be able to express an opinion regarding the changes.

Major: Adverse and beneficial changes in visitor use and/or experience would be readily apparent and have important consequences. The visitor would be aware of the impacts associated with the alternative and would likely express a strong opinion regarding the changes.

Duration: Short-term – Impacts occur only during project implementation activities.

Long-term – Impacts extend beyond project implementation activities.

Cultural Resources

Cultural Landscapes

Negligible: The impact is at the lowest levels of detection or barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Adverse impact - The impact would not affect the character-defining features of a cultural landscape listed on or eligible for listing on the National Register. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact - Character-defining features would be preserved in accordance with the Secretary of the Interior's Standards, therefore maintaining the integrity of the cultural landscape. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse impact - The impact would alter a character-defining feature or features of the cultural landscape but would not diminish the integrity of the landscape to the extent that its National Register eligibility would be jeopardized. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact - The landscape or its features would be rehabilitated in accordance with the Secretary of the Interior's Standards to make possible a compatible use of the landscape while preserving its character-defining features. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse impact - The impact would alter a character-defining feature(s) of the cultural landscape, diminishing the integrity of the resource to the extent that it would no longer be eligible to be listed on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial impact - The cultural landscape would be restored in accordance with the Secretary of the Interior's Standards to accurately depict the features and character of a landscape as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be no *adverse effect*.

Duration: Short-term – Impacts on the natural elements of a cultural resource may be comparatively short-term (*e.g.*, three to five years) until new vegetation grows or historic plantings are restored.

Long-term – Impacts on the natural elements longer than three to five years.

Historic Resources

Negligible: The impact would be at the lowest level of detection or barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor: Adverse impact - The impact would not affect the character-defining features of a historic resource listed on or eligible for listing on the National Register. For purposes of Section 106, the determination of effect would be *no adverse effect.*

Beneficial impact - The character-defining features would be stabilized and/or preserved in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (NPS 1995) to maintain the existing integrity of the historic resource. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse impact - The impact would alter a character-defining feature(s) of the historic resource but would not diminish the integrity of the resource to the extent that its National Register eligibility would be jeopardized. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact - The historic resource would be rehabilitated in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties to make possible a compatible use of the property while preserving its character-defining features. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse impact - The impact would alter a character-defining feature(s) of the historic resource, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial impact - The historic resource would be restored in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties to depict accurately its form, features, and character as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Duration: Short-term – Impacts on the natural elements of a cultural resource may be comparatively short-term (e.g., three to five years) until new vegetation grows or historic plantings are restored.

Long-term – Impacts on the natural elements longer than three to five years.

Archeological Resources

Negligible: The impact on archeological sites is at the lowest level of detection, barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: The impact on archeological sites is measurable or perceptible, but it is slight and localized within a relatively small area of a site or group of sites. The impact does not affect the character-defining features of a listed or eligible National Register archeological site and would not have a permanent effect on the integrity of any archeological sites. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: The impact is measurable and perceptible. The impact changes one or more character-defining feature(s) of an archeological resource but does not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: The impact on archeological sites is substantial, noticeable, and permanent. The impact is severe or is of exceptional benefit. For National Register-eligible or listed archeological sites, the impact changes one or more character-defining features(s) of an archeological resource, diminishing the integrity of the resource to the extent that it is no longer eligible for listing in the National Register. For purposes of Section 106, the determination of effect would be adverse effect. A major impact can also be one of exceptional benefit. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Duration: Short-term – Impacts on the natural elements of a cultural resource may be comparatively short-term (e.g., three to five years) until new vegetation grows or historic plantings are restored.

Long-term – Impacts on the natural elements longer than three to five years.

Natural Resources

Soils and Geologic Hazards

Negligible: Soils would not be impacted, or the impacts on soils would be below or at the lower levels of detection. Any impact on soil characteristics and erosion rates would be slight and would return to normal shortly after project implementation activities.

Minor: Adverse and beneficial impacts on soils would be detectable, but likely short-term. Impacts on soil characteristics and erosion rates would be small. If mitigation were needed to offset adverse impacts, it would be relatively simple to implement and would likely be successful.

Moderate: Adverse and beneficial impacts on soil characteristics and erosion rates would be readily apparent and long-term, and result in a change to the soil character over a relatively wide area.

Major: Adverse and beneficial impacts on soil characteristics and erosion rates would be readily apparent and long-term, and would substantially change the character of the soils over a large area in and out of the park. Mitigation measures to offset adverse impacts would be needed and extensive, and their success would not be guaranteed.

Duration: Short-term – Impacts on soils and geologic resources would last less than one year.

Long-term – Impacts on soils and geologic resources would last more than one year.

Air Quality

Negligible: Air quality would not be impacted, or the impacts on air quality would be below or at the lower levels of detection. Any impact on air quality would be slight and would return to normal shortly after project implementation activities.

Minor: Adverse and beneficial impacts on air quality would be measurable, although the changes would be small and short-term, and the impacts would be localized, temporary, and limited to sensitive resources. For adverse impacts, no air quality mitigation measures would be necessary.

Moderate: Adverse and beneficial impacts on air quality would be measurable and would have noticeable benefits or consequences, although the impact would be relatively local. For adverse impacts, all air quality standards would still be met. There would be short-term exposure to sensitive resources. Air quality mitigation measures would be necessary, and the measures would likely be successful.

Major: Changes in air quality would be measurable, would have substantial benefits or consequences, and would be noticed regionally. For adverse impacts, there would be possible violations of state and federal air quality standards, violation of Class II air quality standards, and/or prolonged exposure to sensitive receptors. Air quality mitigation measures would be necessary, and the success of the measures could not be guaranteed.

Duration: Short-term – Impacts on air quality would last less than one year.

Long-term – Impacts on air quality would last more than one year.

Surface Water Quality and Streamflow Characteristics

Negligible: Impacts would not be detectable. For adverse impacts, water quality parameters would be well below all water quality standards for the designated use of the water. Both quality and quantity of flows would be within historical conditions.

Minor: Adverse and beneficial impacts would be measurable, but water quality parameters would be well within all water quality standards for the designated use. Both quality and quantity of flows would be within the range of historical conditions.

Moderate: Adverse and beneficial impacts on water quality would be readily apparent, but water quality parameters would be within all water quality standards for the designated use. Water quality or flows would be outside historic baseline on a limited time and space basis. For adverse impacts, mitigation would be necessary to offset adverse impacts, and would likely be successful.

Major: Adverse and beneficial impacts on water quality would be readily measurable. For adverse impacts, some quality parameters would periodically be approached, equaled, or exceeded. Flows would be outside the range of historic conditions, and could include flow cessation or flooding. Extensive mitigation measures would be necessary, and their success would not be ensured.

Duration: Short-term – Following implementation activities, impacts on surface water would last less than one year.

Long-term – Following implementation activities, impacts on surface water would last more than one year.

Wetlands

Negligible: Impacts would not be detectable. No measurable or perceptible changes in wetland size, integrity, or continuity would occur.

Minor: Adverse and beneficial impacts would not result in alteration of wetlands. A USACE 404 permit would not be required. The functionality of the wetland would not be impacted. For adverse impacts, no mitigation measure associated with wetlands would be necessary.

Moderate: Adverse and beneficial alteration of wetlands would be apparent such that a USACE 404 permit could be required. Wetland functions would not be impacted in the long term. For adverse impacts, mitigation measures associated with wetlands would be necessary and the measures would likely succeed.

Major: Adverse and beneficial impacts on wetlands would be observable over a relatively large area, would be long-term, and would require a USACE 404 permit. Long-term impacts would affect the functionality of the wetland. For adverse impacts, mitigation measures would be necessary and their success would not be guaranteed.

Duration: Short-term – Following implementation activities, impacts on wetlands would last less than one year.

Long-term – Following implementation activities, impacts on wetlands would last longer than one year.

Vegetation (Including Invasive Species)

Negligible: Individual native plants may occasionally be impacted, but measurable or perceptible changes in plant community size, integrity, or continuity would not occur.

Minor: Adverse and beneficial impacts on native plants would be measurable or perceptible, but would be localized within a small area. For adverse impacts, the viability of the plant community would not be impacted and the community, if left alone, would recover.

Moderate: For adverse and beneficial impacts, a change would occur to the native plant community over a relatively large area that would be readily measurable in terms of abundance, distribution, quantity, or quality. Mitigation measures to offset/minimize adverse impacts would be necessary and would likely be successful.

Major: Adverse and beneficial impacts on native plant communities would be readily apparent and would substantially change vegetative community types over a large area, inside and outside the park. Extensive mitigation would be necessary to offset adverse impacts, and their success would not be ensured.

Duration: Short-term – Following implementation activities, impacts on vegetation would last less than three years.

Long-term – Following implementation activities, impacts on vegetation would last more than three years.

Wildlife and Habitat (Including Species of Concern)

Negligible: Terrestrial wildlife and their habitats would not be impacted, or the impacts would be at or below the level of detection and would not be measurable or of perceptible consequence to wildlife populations.

Minor: Adverse and beneficial impacts on wildlife or habitat would be measurable or perceptible, but localized within a small area. For adverse impacts, the mortality of an individual animal might occur but the viability of wildlife populations would not be impacted, and the community, if left alone, would recover.

Moderate: A change to terrestrial wildlife populations or habitat would occur over a relatively large area. The change would be readily measurable in terms of abundance, distribution, quantity, or quality of population. Mitigation measures would be necessary to offset adverse impacts, and they would likely be successful.

Major: Impacts on terrestrial wildlife populations or habitat would be readily apparent, and would substantially change wildlife populations over a large area in and out of the park. Extensive mitigation would be needed to offset adverse impacts, and the success of mitigation measures could not be ensured.

Duration: Short-term – Following implementation activities, impacts on wildlife and habitat would last less than one year.

Long-term – Following implementation activities, impacts on wildlife and habitat would last more than one year.

NPS Operations and Facilities

Long-term Management and Sustainability of Resources

Negligible: Park operations, long-term management, and sustainability of park resources would not be impacted, or the impact would be at or below the lower levels of detection.

Minor: Adverse and beneficial impacts would be detectable but would be of a magnitude that would not have an appreciable effect on park operations, long-term management, or sustainability of park resources.

Moderate: Adverse and beneficial impacts would be readily apparent and would result in a substantial change to park operations, long-term management, or sustainability of park resources in a manner noticeable to staff and the public.

Major: Adverse and beneficial impacts would be readily apparent and would result in a substantial change to park operations, long-term management, or sustainability of park resources in a manner noticeable to staff and the public, and would be markedly different from existing operations.

Duration: Short-term – Impacts would occur only during project implementation activities.

Long-term – Impacts would extend beyond project implementation activities.

APPENDIX H

FEBRUARY 7, 2005, LETTER FROM USDA-NRCS REGARDING PROPOSED LAND CONVERSION

ATTACHMENT 9

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
2660 Sherman Avenue
Vicksburg, MS 39183

Post-it® Fax Note 7671	Date 06/27/08	# of pages ▶ 2
To Jonathan Bourdeau	From Liz Sargent	
Co./Dept. Mactec	Co. JMA	
Phone # 770/421-3361	Phone # 434/979-1617	
Fax # 770/421-3486	Fax # 434/979-3645	

February 7, 2005

To: Kurt Foote, Natural Resources Program Manager
Vicksburg National Military Park

Re: Proposed land Conversion

Per Vicksburg National Military Park's request, the Natural Resources Conservation Service (NRCS) has made soil loss calculations in the area on the park on the south loop that is being proposed for land conversion from trees to grass. During our prior meeting on site, park management indicated their concern for needing scientific documentation for soil loss that would occur on the area after being converted to grass compared to the current cover.

The NRCS soil loss prediction formula takes into consideration the following: soil type, slope percent, slope length, average rainfall, ground cover and conservation practices installed such as terraces and grade control structures. Basically, the only things that can be changed by man that will affect the soil loss predictions are ground cover and installed conservation practices.

Considering the current ground cover conditions on the site which includes: the average number of trees per acre, the average percent tree canopy cover and the average percent mulch cover, the estimated average annual soil loss currently occurring on this area is 1.5 tons per acre.

The following assumptions were made in predicting the soil loss rate after land conversion to grass on the same site.

1. Finished slopes graded to a minimum of 3:1 slopes.
2. 100 percent cover of bermuda grass established using the following fertilizer and seeding rates per acre:
   20 lbs. common bermuda grass seed
   600 lbs. 13-13-13 fertilizer
   2 tons agriculture lime
3. Erosion control blanket installed in the concentrated flow areas.
4. Mechanically mowed throughout summer growing season.
5. Overall highly managed to maintain 100% grass cover.

Considering these assumptions, the estimated average annual soil loss after land conversion would be .9 tons per acre.

ATTACHMENT 9

The Park Service management team indicated there is an interest within to consider incorporating various species of native grasses along with bermuda grass for the proposed cover. I have researched this idea with state and national level agronomist and have concluded that under the circumstances the park is dealing with, the native species will be extremely difficult to establish. Also, the erosion rates would be elevated significantly higher than with the current woodland cover. Therefore, I would strongly discourage attempting to establish native grasses other than bermuda on this site.

Please call if I can be of any further assistance concerning this matter.

Raymond Joyner, District Conservationist
USDA, Natural Resources Conservation Service